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INVESTIGATIONS

OF THE

Department of Psychology and Education

OF THE

UNIVERSITY OF COLORADO

ARTHUR ALLIN, EDITOR.

Medical Inspection of Schools

BY HOMER W. ZIRKLE, M. A.

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CONTENTS.

EDITORIAL.

With the present number, Volume I of the Investigations is concluded.

The first number on "Medical Inspection of Schools" endeavored to present the data on this subject in as complete a manner as possible. The work accomplished along this line in European countries and in America amply justifies the reform movement begun in all our progressive schools. The information gathered from every available source will, we hope, prove of much assistance to Superintendents and Principals who desire to introduce medical inspection into their school systems.

The second number, dealing principally with the "Survival Values of Play," is an attempt to arrive at the scientific value of play. Its place as an essential factor of the school curriculum can be regarded as once and for all time firmly established. Indirectly this investigation of play phenomena is an attempt to substitute scientific investigation for sectarianism in the field of pedagogy. Herbartianism and Froebellianism are interesting as historical stages, but can be regarded only as creeds more or less outworn. The second part of the same number dealt with the statistics of the growth and development of education in the Western States of the Union. Its rapid growth, its solid support on the part of the people, and its thoroughly democratic character were clearly evidenced by the facts adduced.

The third number dealt with the influence of various sociological and psychological movements on education. It was in a way a résumé of educational progress for the year, not from an administrative but from a scientific standpoint.

The present number has in view the need existing in many high schools of more extensive libraries for the use of students and teachers, the many and repeated requests from high-school authorities having led to its compilation. It does not claim to furnish a sufficient or a complete list of books, but additions and corrections may be added in a succeeding number. The various lists have been furnished largely by the professors of the University in the various departments, but special thanks are due to Prof. M. F. Libby, Prof. W. H. Nichols and Prof. F. A. Howe, for their courtesy and assistance.

THE EDITOR.

CONTENTS.

I.

INTERDEPENDENCE OF THE MENTAL AND THE PHYSICAL.

Scientific research has of late years thrown much light upon the relation between physiological and psychical functions. (1) It has been conclusively shown that the mental and the physical are mutually interdependent.

That physical exercise produces mental fatigue, i. e., fatigues the nerve centres, and that mental exertion produces muscular fatigue is an established fact. This fact established physiologically, especially by Mosso, forms the basis for these views in reference to the relative amount of work which can be demanded of the human, and especially of the child, organism. Besides, Mosso, Key, Burgerstein, Laser, Höpfner, Kræpelin, Schmid-Monard, Binet and Henri, Griesbach and others have studied by different methods the point of time when fatigue commences in mental work. The majority of the methods applied by these investigators rests upon the supposition that certain bodily actions can not be performed in a state of mental fatigue, or that certain skin sensations of touch are less sharply defined in mental fatigue than in a state of mental freshness. These investigations have an intensely practical value, as they are already influencing the length of the periods of recitation, recreation, and the program as to the succession of studies, the time and method of training in the gymnasia, high schools, etc. Further investigation may soon solve the problem of how much mental exertion should be required of each age or period of development, that evil may not result from over-exertion at critical periods.

The amount of blood supplied to any organ is in proportion to the amount of work the organ has to perform. The brain is one of the most vascular organs in the body, and receives about one-fifth of all the blood supply of the body. An insufficient supply of blood to the brain detracts from its full power of cerebral action. When there is an increased supply the feelings are aroused, the thoughts are more free and rapid. In great mental excitement there is an increased supply of blood to the brain. Also powerful mental exertion causes a diminution of blood from the extremities of the body and a greater supply to the brain.

The quality of the blood is no less important than the quantity in relation to brain activity. It supplies nutriment and must possess all the elements necessary to cerebral activity that it may minister most efficiently to healthy brain life. Deleterious substances, such as narcotics, introduced into the blood, disorders that life and may totally destroy it. Feebleness

(1) The ordinary, empirical view of the relationship existing between mind and body is adopted in this discussion for practical reasons. Any metaphysical discussion would be obviously out of place.

of brain function is occasioned by anaemia, caused by insufficient food, indigestion, hemorrhages, over-work or disease. This anaemia is the poverty of the blood in red corpuscles which carry the oxygen of the blood.

Says Dr. J. Crichton-Browne (1): "These corpuscles can now be readily counted in a given quantity of blood, and the degree in which they fall short of the standard of health can be estimated. That anaemia, however slight, is incompatible with good brain work is already an established fact, and it is to be hoped we shall soon be able to fix a point in anaemia beyond which no educational work should be attempted."

PHYSICAL DEVELOPMENT.

Since education is concerned with growth of mind, and growth of mind depends on growth of brain, and growth of brain on growth of body, it is all important to determine the laws which regulate physical development, and to know in what degree body growth may be taken as an index of cerebral development.

Factors of variation in stature and weight, aside from age and race, are nutrition, exercise, sanitation, occupation, climate and density of population. The limitations of a man's stature are probably determined by heredity, but these factors of variation determine whether he shall attain his full stature and weight. This seems conclusive from a comparison of the statistics which follow.

TABLE I.

Adapted from Roberts' Tables in His Work on Anthropometry, Showing the Average Height and Weight and Annual Rate of Increase of 7,709 Boys between the Ages of 10 and 20 Years, of the Most Favored Classes of the English Population—Public School Boys, Naval and Military Cadets, Medical and University Students.

Age Last Birthday.	Height without Shoes. Average Inches.	Growth Inches.	Weight including Clothing. Average Lbs.	Growth Lbs.
10	53.40	.....	67.4	.....
11	54.91	1.51	72.9	5.50
12	56.97	2.06	80.3	7.39
13	58.79	1.82	88.6	8.27
14	61.11	2.32	99.2	10.61
15	63.47	2.36	110.4	11.21
16	66.40	2.93	128.3	17.92
17	67.84	1.46	141.0	12.69
18	68.29	.43	146.0	4.97
19	68.72	.43	148.3	2.20
20	69.13	.41	152.0	3.87

(1) In Morris' Book of Health, Chapter on Education and the Nervous System, p. 291.

TABLE II.

Adapted from Roberts' Tables, Showing the Average Height and Weight and the Annual Rate of Increase of 7,855 Boys between the Ages of 10 and 20 of the Artisan Class—Town Population.

Age	Height without Shoes.		Weight including Clothing.	
	Average	Growth	Average	Growth
Last Birthday.	Inches.	Inches.	Lbs.	Lbs.
10	50.52	.....	66.31	.....
11	51.52	1.00	69.46	3.15
12	52.99	1.47	73.68	4.22
13	55.93	2.94	78.27	4.59
14	57.76	1.83	84.61	6.34
15	60.58	2.82	96.79	12.18
16	62.93	2.35	108.7	11.93
17	64.45	1.52	116.4	7.66
18	65.47	1.02	123.3	6.97
19	66.02	.55	128.4	5.08
20	66.31	.29	130.6	2.20

A comparison of Roberts' tables of the artisan and well to-do classes shows that the average height difference between the two classes varies between the ages of 10 and 20 from 2.82 inches to 3.98 inches, being least at the ages of 10 and 20 and greatest at 12, 16 and 17. The laboring class not only gains less annually, but is slower in gaining the increase by about one year.

In weight the difference between the two classes is at 10 years 3.44 pounds, which gradually increases till it reaches 25.6 pounds at the age of 17. The same corresponding superiority of the most favored class in chest-girth is shown by Dr. Roberts' tables to increase progressively till adult life.

This remarkable difference is due, perhaps partly to heredity, but more to the less favorable conditions of food, exercise and sanitation on the part of the laboring classes in large cities.

Dr. Roberts' tables also show that children and youths of the professional classes living in the country exceed those of the same classes living in towns by about one inch in height at all ages from 10 to 20, and in an amount varying progressively from 1 to 7 pounds in weight. Dr. Roberts has also collected tables showing the heights and weights of idiots and imbeciles in English public institutions. These show considerable inferiority to the class of artisan and factory operatives.

Key, comparing the curves of development in American, English and Swedish children, concludes that "the weak period of development before puberty is lengthened for the poorer children." This confirms Roberts' report, which shows the increase to be about one year later in the artisan class than in the well-to-do class.

Cowell (1) of England in 1833 compared 1,062 factory children and 228 others in more favorable circumstances and draws the same conclusion.

BOWDITCH'S TABLE.

	Height (in.)			Weight (lbs.)		
Age.	Favored.	General	Difference.	Favored.	General	Difference.
10............	53.51	51.68	1.83	70.6	65.36	5.24
11............	54.96	53.33	1.63	75.3	70.18	5.12
12............	56.78	55.11	1.67	85.9	76.92	8.98
13............	59.60	57.21	2.39	94.4	84.84	9.56
14............	61.51	59.88	1.69	99.9	94.91	4.99
15............	64.20	62.36	1.84	116.6	107.10	9.50
16............	65.83	65	.83	125.8	121.01	4.79
17............	67.44	66.16	1.28	135.2	127.49	7.61
18............	67.44	66.66	.78	138.2	132.55	5.65

Bowditch's table shows a comparison of the average heights and weights of a favored class and all the population of Boston averaged together. The favored class were selected to correspond to the class of England who attend the public schools and universities.

It will be observed that those whom Dr. Bowditch has selected as the favored class as regards the comforts of life exceed the average of the whole population in height, varying from .78 of an inch to 2.39 inches, and in weight ranging from 4.79 pounds to 9.56 pounds, in weight and stature being greatest at the age of 13. As the "general" includes the favored as well as the poor, it is plain that the real difference is even greater than that shown in the table. Dr. Bowditch concludes that "Deprivation of the comforts of life has a greater tendency to diminish stature than the weight," and "that the importance of mode of life as a factor in determining the size of growing children in this community is at least equal to and possibly even greater than that of race."

A comparison of the children in the city schools of Moscow (2) with factory children of the same city shows the following differences in centimeters in favor of the school children:

Age...........	9	10	11	12	13	14	15	16	17
Boys..........	4	4.6	5.7	5.7	7.7	9	9.7	8.7	5.4

A comparison by the same author of school girls and factory girls gives the following figures in centimeters:

Age	8	9	10	11	12	13	14	15	16
School girls...	116.4	119.6	125	129.7	132.9	138.3	145.8	146.4	150.3
Factory girls..	118.8	123.6	129.5	131	135.5	139.9	143.4	148.2	151

This shows a decided superiority in stature for the factory girls.

(1) Burk, "Growth of Children," American Journal of Psychology, Vol. 9, April, 1898, page 272.

(2) Burk, "Growth of Children," American Journal of Psychology, Vol. 9, page 276.

Pagliani (1) compares the girls in a private school in Turin, Italy, with those of charity girls. At the age of 15 the charity girls are in weight an average of 37.1 kg., the school girls 45.6 kg. In stature the school girls are also ahead.

The following table by Weissenberg shows that the poor are less in height and weight than the wealthy and middle classes.

WEISSENBERG'S TABLE. (2)

AGE	Length of Body			Weight of Body			Strength of Lift		
	Poor	Middle Classes	W'lthy	Poor	Middle Classes	W'lthy	Poor	Middle Classes	W'lthy
	Cm.	Cm.	Cm.	Kilos.	Kilos.	Kilos.	Kilos.	Kilos.	Kilos.
10 years.....	124.2	124.7	125.6	25.95	25.69	36.2	36.2	34.6	32.1
11 "	125.9	128.9	131.5	26.99	27.29	27.28	40.1	40.7	40.1
12 "	130.8	135.5	137.8	29.03	30.75	31.97	49.4	54.2	53.2
13 "	133.3	137.7	140.4	32.23	33.34	34.74	54.5	60.8	60.5

(3) "According to Liharzik, growth is regular, and all deviation tends to produce disease, as disease also produces deviation. A large head is frequently accompanied with a contracted chest; here mental action may be slow—probably from deficient supply of purified blood. Boys of small frames often have rather large heads and are deficient in repose of character. City-bred children are usually more vivacious, but have less power of endurance than children reared in the country."

The late report of the anthropometric committee of the British Association for the Advancement of Science gives the results of observations of over 50,000 individuals. This report shows that in boys from 11 to 12 years of age there is a difference of about 5 inches in the average height between the worst and best matured classes in the community.

Dr. Paul Hasse, in 1880, measured 2,806 children in Gohlis-Leipzig—1,386 boys and 1,420 girls. Says Dr. MacDonald (4) of this investigation: "Comparing the poor with the well-to-do classes, the results show that for boys of the same age the height varies from .7 to 4 centimeters in favor of the well-to-do classes; for girls it varies from 1.7 to 4.1 centimeters in favor of the well-to-do. The children of the well-to-do classes excel also in weight for the same age; for boys the excess runs from .3 to 4.7 pounds; for girls from 1.6 to 4.6 pounds."

Hasse also found that the weak or defective children, who could not attend school regularly, were usually abnormally developed or had some chronic ailment. About 9 per cent. of the children in the primary schools belonged to this class. Many of these children in certain years were taller and heavier than the average. Dr. Crichton Browne also suggests that there is reason for alarm when a child greatly exceeds the normal growth, as well as when he falls far short of it.

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(1) Burk, "Growth of Children," American Journal of Psychology, Vol. 9.
(2) Arthur MacDonald, "Growth and Sociological Conditions." Reprint from Boston Medical and Surgical Journal, Sept. 14, '99.
(3) Ibid.
(4) Ibid.

The Anthropometric Committee of England in their report of 1893 gave the height and weight of the inmates of the Swinton Industrial School of England. These children "represent the most unfavorable condition of life and heredity." Compared with boys of Roberts' most favored class, these boys are shorter by 3.31 inches and lighter by 10.64 pounds at the age of 10; at the age of 14 they are 6.65 inches shorter and 21.85 pounds lighter.

RELATION OF SIZE TO PRECOCITY AND DULLNESS.

The foregoing reports conclusively show that mode of life, exercise and sanitary conditions largely determine the stature and weight of a growing child. There seems also to be a direct relation between physical growth and mental development.

Dr. Townsend Porter (1) tabulated weights and heights of 34,500 boys and girls of the St. Louis schools, from the kindergarten to the high schools, inclusive. He concludes that on the average precocious children are heavier and taller than their duller fellows of the same age. He compared the mean weight and height of pupils of a given age with the average weight and height of pupils of the same age found in the different grades. Thus he found that the mean weight of boys of 12 years is 73.61 pounds.

The average weight of the boys of the same age found in the I. grade is 70, in the II. 69.50, in the III. 72.17, in the IV. 73.86, in the V. 74.69, in the VI. 77.29, in the VII. 76.50. The mean weight of girls at the age of 13 is 83.73. The average weight of those 13 years old found in the II. grade was 79.50, in the III. 76.50, in the IV. 81.92, in the V. 82.78, in the VI. 86.95, in the VII. 87.63, in the VIII. 88.50.

The Department of Child Study and Pedagogic Investigation of the Chicago public schools, in 1899-'00 (2), weighed, measured and tested with reference to their physical powers 497 pupils of the age of 12, found in the various grades. The great number of pupils included in this table still more forcibly confirms the parallelism between physical superiority and mental capacity.

TABLE OF TWELVE-YEAR-OLD PUPILS BY GRADES OF THE CHICAGO PUBLIC SCHOOLS.

GRADE	No. Ex.	Av. Age.	Av. Ht. mm.	Av. Wt. kg.	Av. Erg. kg.-cm.	Av. Strength of Grip. Right Hand. kg.	Av. Strength of Grip. Left Hand. kg.	Av. Vital Capacity. cu. cm.
II	4	12-3-28	1333	29.513	233	16.75	16.50	1488
III	19	12-5-23	1377	33.592	248.7	20.03	18.55	1732
IV	84	12-5- 2	1403	34.972	271.3	20.22	18.85	1742
V	134	12-5- 9	1422	35.596	268	21.06	19.64	1790
VI	143	12-5-20	1443	36.136	271	21.40	20.12	1887
VII	95	12-6-13	1451	37.150	283	22.31	20.41	1947
VIII	18	12-6-29	1443	38.453	318.6	23.31	21.07	3053

(1) Burk, "Growth of Children," American Journal of Psychology, Vol. 9, April, 1898, page 295.

(2) Reprint of Report of Department of Child Study and Pedagogic Investigation, 1900, pages 35 and 36.

Dr. John Punton (1), who made extensive investigations as to health and measurements of pupils in the Kansas City high school, is of the opinion that to take the age of a child as a criterion of its mental strength and capacity is very erroneous, and that it is far more logical and scientific to allow the height and body weight of a pupil to govern this important question.

The anthropometrical investigations that have thus far been made in the schools seem to be unanimous in the verdict that the mental development of a pupil is directly related to his height, weight and physical measurements, and that there is a physical basis for precocity on the one hand and mental dullness on the other.

It does not necessarily follow that small men are mentally duller than large men. For it seems that every individual has his limitations of size fixed by heredity from birth. If this size is attained in its fullness the individual has had his normal development; if stunted, he is mentally duller than he should have been.

Nor does it follow that this is always true in every individual case. It frequently occurs that the smallest and the youngest pupil in the class is the brightest intellectually. These are exceptions to the general rule, constituting a type by themselves, and should afford subjects for special study by the school physician, who should always be psychologist as well as physician.

Dr. Tarbell (2) of the Boston Home for the Feeble-Minded, measured and weighed the inmates of that institution, ranging in age from 6 to 19 years, and found that the average height was about two inches shorter than the normal height of children of the same age, and their weights about nine pounds less. Dr. G. E. Shuttleworth (3) of England collected the weights and measurements of 1,209 idiots and imbeciles of English asylums and found that they confirmed the report of Dr. Tarbell. Dr. Shuttleworth makes a similar report of 300 idiotic and imbecile children and finds them to have been shorter than normal children by one inch at 5 years, two inches at 10 years, three inches at 15 and 20 years. They were lighter in weight by 4½ pounds at 8 years, by 6 pounds at 10 years, by 8 pounds at 15 years, and by 23 pounds at 20 years.

These figures seem to show conclusively that there is a relation between healthy physical growth and mental development.

Combe (4) of Lausanne gives data on 2,000 school children covering a period of six years from the age of 9 to 15. He included all afflictions—acute and chronic. The percentage of sickness for boys ranges from 64 per cent. in the 9th year to 29 per cent. in the 14th year, fluctuating between

(1) "Relation of the Science of Medicine to Public School Education." Read before the Tri-State Medical Society at St. Louis, April 8, 1897.
(2) Burk, "Growth of Children," American Journal of Psychology, Vol. 9, page 298.
(3) Ibid, page 299.
(4) Ibid, page 289.

these points from the 9th to the 15th year. His percentage for girls is as follows: 88 per cent. in the 9th year, 75 per cent. in the 10th year, 60 per cent. in the 11th year, 68 per cent. in the 13th year, 61 per cent. in the 14th year, and 39 per cent. in the 15th year.

Schmid-Monard's (1) observations of several thousand pupils of Halle show from 5 per cent. to 10 per cent. less of sickness among boys than girls, and that sickness varies according to kind of schools, social condition of pupils and age. Averaging these he finds that the number sick of boys ranges from 18 to 30 per cent., and of girls from 27 to 40 per cent.

DR. FRANCIS WARNER'S STUDY OF CHILDREN. (2)

In 1888 a committee was appointed by the British Medical Association to study school children as to their mental and physical status. As a result of this committee's work 100,000 children were examined individually upon a fixed plan, taking a written description and a schedule for each child in any point subnormal, or reported by the teacher as dull or backward.

Dr. Francis Warner, who was the leading member of this committee, from these investigations deduces the following propositions concerning childhood:

I. The main classes of defect among school children include a larger proportion of boys than girls.

II. The main classes of defect among school children are much associated in groups of cases; such associations vary with sex, age and environment.

III. Children with developmental defects often present also abnormal nerve signs and are delicate and dull.

IV. Children with indications of brain disorderliness, i. e., abnormal nerve-signs, are often dull pupils.

V. Dull pupils are often delicate, with indications of brain disorderliness; i. e., abnormal nerve-signs.

VI. Girls with developmental defects or brain disorderliness are more apt to receive harm and less good from their environment than boys.

VII. The effects of good physical training in schools are to diminish the number of cases with signs of brain disorderliness and number of dull children (3).

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(1) Burk, "Growth of Children," American Journal of Psychology, Vol. 9, page 289.

(2) Warner's Study of Children, Macmillan, 1898.

(3) Ibid, pages 230 ff.

SELECTED FROM WARNER'S TABLE VII. (1)

Based on 50,000 Children Seen in Day Schools, mostly in or near London (1892-1894); viz., 26,287 Boys, 23,713 Girls. Showing the Total Number of Children with each Main Class of Defect and Groups of Defect, and the Percentage on the Number of Children Seen of all Ages.

Main Classes of Defect and Groups of Defect.	Number in Groups.		Percentage on Number of Children Seen.	
	Boys.	Girls.	Boys.	Girls.
All children with developmental defect...	2,308	1,618	8.8	6.8
All children with abnormal nerve signs...	2,853	2,015	10.8	8.5
All children with low nutrition...........	749	770	2.8	3.2
All children mentally dull...............	2,074	1,634	7.9	6.9
All children with some defect not included in groups above.....................	336	323	1.2	1.3

WARNER'S TABLE VIII. (2)

Based on 50,000 Children Seen in Day Schools, mostly in or near London (1892-1894); viz., 26,287 Boys, 23,713 Girls. Showing the Co-Relation or Association of the Main Classes of Defect Observed in Children.

The table is arranged in four columns, giving the percentages for children in the age groups and at all ages. The percentages are taken on the number with the main class of defect.

Thus: Of all cases with development defect at all ages, 38.4 per cent. of the boys and 49.9 per cent. of the girls were mentally dull.

Of all the dull children at all ages, 57.6 per cent. of the boys and 52.6 per cent. of the girls also presented abnormal nerve-signs.

(1) Warner's Study of Children, page 249.
(2) Ibid, page 250.

TABLE VIII.

	7 Years and Under. Boys.	7 Years and Under. Girls.	Age 8-10. Boys.	Age 8-10. Girls.	Age 11 and Over. Boys.	Age 11 and Over. Girls.	All Ages. Boys.	All Ages. Girls.	
				A					All cases with developmental defect, B. 2,308, G. 1,618.
AB	31.7	28.5	43.3	41.4	40.5	44.0	38.4	36.2	Per cent. with abnormal nerve-signs.
AC	22.7	35.0	16.0	22.1	7.5	15.0	16.2	26.3	Per cent. with low nutrition.
AD	36.6	40.8	41.2	46.6	37.1	51.1	38.4	44.9	Per cent. with mental dullness.
				B					All cases with abnormal nerve-signs, B. 2,853, G. 2,015.
AB	35.1	42.2	30.6	28.0	28.3	21.4	31.0	29.1	Per cent. with developmental defect.
BC	19.6	27.4	11.3	15.2	7.5	10.2	12.3	16.6	Per cent. with low nutrition.
BD	43.3	47.0	42.6	41.9	39.6	40.4	41.8	42.6	Per cent. with mental dullness.
				C					All cases with low nutrition, B. 749, G. 770.
AC	52.5	66.1	51.0	50.4	39.3	35.5	49.9	55.5	Per cent. with developmental defect.
BC	41.1	36.0	51.1	51.1	56.4	49.9	47.1	43.5	Per cent. with abnormal nerve-signs.
CD	43.6	42.0	44.8	40.7	37.6	35.6	43.1	40.5	Per cent. with mental dullness.
				D					All dull children, B. 2,077, G. 1,635.
AD	45.9	55.1	43.3	42.6	38.6	34.9	42.8	44.4	Per cent. with developmental defect.
BD	49.0	44.1	63.4	56.6	59.1	56.7	57.6	52.6	Per cent. with abnormal nerve-signs.
CD	23.6	30.1	14.8	16.3	7.5	10.2	15.5	19.0	Per cent. with low nutrition.

Dr. Punton of Kansas City examined 400 pupils, 200 boys and 200 girls, of the Kansas City high school, as to health, physical defects and measurements. He says: "We selected at random from the general assembly hall of the high school 200 boys and a similar number of girls, whose ages ranged from 13 to 21, and subjected them to similar examinations as pursued in other large schools. Our investigations proved conclusively that out of 200 boys 34 per cent. were found to possess a nervous temperament, as demonstrated by either a history of direct inheritance or the character of the pulse, and 35 per cent. of these were found to be subject to physical defects. When the measurements of these nervous children are compared with Dr. Sargent's chart of Boston boys of the same age, we find that the weight of our boys was 6.3 pounds less, and the height .9 of an inch less than that of the Boston boys, while the heart rate was also six beats per minute faster.

Not only were these nervous children found to be deficient in weights and measurements, but the general average of all the boys examined was found to be in nearly every instance deficient in weight, height and other vital measurements. For instance, the average weight of the Kansas City high school boy at the age of 16 is 126 pounds, against 132.3 pounds of the Boston boy, while the average height of the Kansas City boy is 5 feet 6.7 inches, as against 5 feet 7½ inches of the Boston boy, a clear loss of .8 of an inch. Again, the girth of the neck, which is considered one of the most vital measurements of the body, was also deficient. Besides this, the breadth of the shoulders was found to be deficient to the extent of .8 of an inch. The expansion of the chest, which is also a valuable guide to lung capacity, was found to be half an inch less than in the Boston boys of the same age.

Nervous force, which was measured by the dynamometer, we found to be equal with that of the eastern boys of the same age, which would suggest, at least in view of all the other deficiencies, that our own boys were using more nervous force at the expense of their physical strength than are their Boston friends. The average heart beat of nine-tenths of the boys examined in our high school was 84, which is entirely too rapid for health, and is in itself an indication of physical weakness." (1).

(1) "The Relation of the Science of Medicine to Public School Education," by John Punton, M. D. Read before the Tri-State Medical Society at St. Louis, April 8, 1896.

TABLE

Showing a Comparison of the Heights and Weights of Pupils in the Kansas City High School, by Superintendent Greenwood, with Pupils of the Boston High Schools, by Dr. Sargent of Harvard.

Age.	K. C. Weight.	Height.	Boston Weight.	Height.
14..............	92.2 lbs.	4 ft. 10.5 in.	99½ lbs.	5 ft. 2 in.
15..............	107.3 lbs.	5 ft. 2.8 in.	112 lbs.	5 ft. 5 in.
16..............	119 lbs.	5 ft. 3.9 in.	132 lbs.	5 ft. 7.5 in.
17..............	136.6 lbs.	5 ft. 4.8 in.	134½ lbs.	5 ft. 7.6 in.
18..............	136.8 lbs.	5 ft. 6.6 in.	135 lbs.	5 ft. 7.8 in.

In 1899 Dr. Christopher (1) of Chicago, assisted by others, made some very interesting observations on Child Study and Scientific Pedagogy. Most of these investigations were made in the Alcott school. This school was selected because it contained pupils that may be called normal—such as are well fed, well clothed, and the great majority being of American birth. There were over 1,200 pupils tested.

The scope of the investigations may be shown by the following card, on one of which were recorded the tests for each individual pupil:

No.........

Name...................................... Sex..................

School.................................... Grade................

Teacher ....

....

Birthday—Year.............. Month................... Day.............

Age—Years................. Months................ Days................

School standing ....

Attention ....

Memory ....

Grasp of work ....

Best work is in ....

Deportment ....

....

Date ....

(1) Forty-fifth Annual Report of the Board of Education, Chicago, for the year ending June, 1899, pages 27-75.

Height with shoes ....
Height of heel ....
Net height ....
Height sitting ....
Weight with clothes ....
Weight of clothing, est. ....
Net weight, est. ....
Ergograph—Hour ....
Weight used ....
Centimeters traveled ....
Work—Centm. grams ....
Fatigue commences—sec ....
Duration of work ....
Dynamometer, R ....
Dynamometer, L ....
Lung capacity ....
Audiometer, R ....
Audiometer, L ....
....

All the tests made were by the most improved scientific methods and were carefully done. The results of these investigations are graphically shown in a series of tables and charts of norms, or averages, which appear quickly to the eye. Mosso's ergograph, slightly modified by Mr. F. W. Smedley, was used for collecting data on the phenomena of fatigue and endurance. Tests were made on the same pupils at intervals of about three-quarters of an hour during the school day. From these ergographic tests the following conclusions were drawn:

1. The extremes of endurance and fatigue in school are greater in the morning than in the afternoon.

2. A higher grade of power is found in the morning session in children attending two sessions daily.

3. While endurance is not as great, it is better sustained in the afternoon.

In summing up in a general way the conclusions that may be drawn from these data, Dr. Christopher says:

"While many interesting deductions might be made from the foregoing observations, I deem it best to present only the following conservative conclusions, which I believe are fully justified by the observations:

"1. In general there is a distinct relationship in children between physical condition and intellectual capacity, the latter varying directly as the former.

"2. The endurance (ergographic work) of boys is greater than that of girls at all ages, and the difference seems to increase after the age of nine.

"3. There are certain anthropometric indications which warrant a careful and thorough investigation into the subject of co-education in the upper grammar grades.

"4. Physical condition should be made a factor in the grading of children for school work, and especially at the entrance into the first grade.

"5. The great extremes in physical condition of pupils in the upper grammar grades make it desirable to introduce great elasticity into the work of these grades.

"6. The classes in physical culture should be graded on a physical instead of an intellectual basis."

Being convinced of the importance of these investigations by Dr. Christopher's committee, the Board of Education (1), on September 6. 1899, established an independent department for Child Study and Pedagogic Investigation. Mr. F. W. Smedley was appointed director of the department, with several assistants. The objects and functions of the department are set forth as follows:

I. Research work—
   a. Collecting anthropometric and psycho-physical data for the purpose of establishing norms, and for determining such relationships as may be of service in pedagogy.
   b. Applying accurate scientific methods to specific pedagogic problems, particularly methods of teaching and determination of the pedagogic value of various studies.

II. Examination of individual pupils with a view to advising as to their pedagogic management.

III. Instruction to teachers in child study and psychology.

This we believe to be a great step in the right direction. The state undertakes the task of educating its children, and as it practically monopolizes elementary instruction, it seems proper that the state should promote the advancement of pedagogic knowledge.

This is probably the only public board of education that has ever established, under its charge and direction, a separate department for pedagogic research. Scientific child study with reference to pedagogy in its infancy, so to speak. We are in the main blindly following tradition rather than the results of scientific research on this most important subject. A great part of the work done so far on the subject of child study has been unscientific and unskillful, and therefore worthless. Other boards of education in our large cities ought to follow the example of the Chicago board and establish departments for research along special lines. The sum total of the results obtained would be far reaching. Norms on all phases of child life could soon be established, which would serve as a positive criterion for child development.

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(1) Reprint of the Report of the Department of Child Study and Pedagogic Investigation, from Annual Report of Board of Education of Chicago, 1899-1900.

The department thus established continued the work begun by Dr. Christopher and still more positively established the conclusions already reached. Among many other things these investigations show that the pupils with normal physical development have a higher school standing than their classmates less developed. The average of those at or above grade is superior to the average of those below grade in height, weight, ergographic work, strength of grip and lung capacity, as is shown in the following table:

PHYSICAL DEVELOPMENT AND SCHOOL TRAINING.

Boys.

Age	NUMBER TESTED		Average Age	Height Stand'g mm.	Height Sitting. mm.	Weight. kg.	Ergograph. kg.-cm.	Right Grip. kg.	Left Grip. kg.	Vital Capacity. cu. cm.
8	At and above grade	210	8-5-25	1238	679	25.286	170.1	13.46	12.49	1395
	Below	45	8-4-12	1210	667	23.790	155.2	12.05	11.68	1353
9	At and above grade	151	9-6-21	1300	702	27.907	209.4	16.12	15.32	1588
	Below	77	9-5-2	1264	692	26.787	198.2	14.59	13.66	1472
10	At and above grade	158	10-6-1	1340	717	30.258	240.5	17.84	16.62	1670
	Below	96	10-5-25	1314	707	29.145	225.7	17.42	16.52	1642
11	At and above grade	125	11-6-23	1376	731	32.814	270.6	20.05	18.64	1828
	Below	103	11-5-25	1363	727	32.180	264.1	19.82	18.82	1766
12	At and above grade	130	12-6-10	1436	754	36.843	306.6	23.38	21.44	2063
	Below	126	12-5-4	1399	740	34.370	286.2	21.38	19.70	1844
13	At and above grade	117	13-6-18	1500	782	41.470	372.4	27.42	24.98	2334
	Below	113	13-5-1	1475	771	39.040	341.5	25.07	23.38	2163
14	At and above grade	146	14-6-3	1564	815	46.218	437.3	30.69	28.31	2638
	Below	104	14-5-2	1520	793	42.775	404.9	29.13	27.05	2360
15	At and above grade	125	15-5-26	1622	843	51.394	507.8	36.64	33.54	2978
	Below	80	15-5-23	1599	827	50.369	515.9	35.79	33.40	2749
16	At and above grade	77	16-5-28	1689	881	58.246	606.8	43.21	39.86	3542
	Below	69	16-4-25	1637	859	53.289	575.7	40.90	37.69	3165
17	At and above grade	46	17-5-14	1702	897	60.417	654.	47.57	43.60	3646
	Below	46	17-5-24	1677	884	58.069	648.7	46.23	41.89	3495
18	At grade	23	18-5-27	1737	917	60.971	670.	50.53	44.82	3644
	Below	17	18-4-3	1726	911	64.252	723.8	51.41	48.17	3741

Girls.

8	At and above grade	187	8-6-10	1236	677	24.373	147.4	11.89	11.16	1238
	Below	45	8-4-26	1195	662	22.424	120.2	10.73	10.08	1113
9	At and above grade	156	9-6-15	1283	693	26.862	174.9	13.94	12.97	1381
	Below	65	9-4-29	1266	688	25.769	163.	13.77	13.12	1308
10	At and above grade	157	10-6-5	1330	711	29.289	193.4	15.61	14.62	1452
	Below	83	10-4-5	1308	704	28.365	183.8	14.91	13.98	1465
11	At and above grade	121	11-5-25	1390	738	32.651	223.7	18.04	17.16	1611
	Below	102	11-5-5	1370	731	31.516	219.3	17.	15.87	1560
12	At and above grade	132	12-5-27	1456	767	36.655	252.4	20.38	19.12	1763
	Below	115	12-5-10	1423	756	35 958	244.2	19.77	18.69	1675
13	At and above grade	154	13-7-3	1526	803	42.673	296.3	23.94	22.10	1939
	Below	101	13-5-13	1492	788	40.036	291.8	23.08	21.60	1901
14	At and above grade	226	14-6-20	1572	833	48.060	347.6	26.41	24.22	2160
	Below	75	14-5-23	1539	802	44.532	332.9	25.53	23.81	1986
15	At and above grade	314	15-6-9	1576	842	49.745	360.7	28.09	25.96	2255
	Below	65	15-4-24	1564	831	47.413	336.2	27.09	25.07	2083
16	At and above grade	182	16-6-19	1599	855	53.091	389.3	30.01	27.79	2340
	Below	172	16-4-23	1584	848	50.773	405.7	28.95	26.80	2267
17	At and above grade	132	17-5-29	1602	855	53.039	373.4	29.97	27.23	2331
	Below	119	17-5-1	1590	851	51.663	366.5	29.23	26.97	2274
18	At grade	63	18-5-2	1597	856	53.214	387.2	30.15	27.84	2396
	Below	74	18-4-19	1594	858	52.846	376.7	29.57	27.69	2311

COMPARISON OF THE JOHN WORTHY AVERAGES WITH THE NORMS.

A comparison of the John Worthy (1) pupils with the normal pupils shows the John Worthy pupils to be inferior in all the principal measurements, and the inferiority increases with age.

Net Height.

Age.	No.	John Worthy Average.	Normal.	Per Cent John Worthy Is of Normal.
		mm.	mm.	
9	2	1312	1289	101.78
10	10	1303	1330	97.97
11	24	1335	1370	97.45
12	54	1378	1418	97.19
13	47	1435	1488	96.44
14	65	1458	1546	94.32
15	51	1518	1613	94.04
16	24	1535	1665	92.19
17	7	1573	1690	93.07

Height Sitting.

		mm.	mm.	
9	2	704	699	100.77
10	10	710	713	99.57
11	24	715	729	98.07
12	54	736	747	98.52
13	47	755	777	97.04
14	65	771	806	95.65
15	51	774	837	92.47
16	24	795	871	91.27
17	7	819	891	91.91

Weight.

		kg.	kg.	
9	2	29.075	27.616	105.28
10	10	30.333	29.837	101.63
11	24	31.527	32.519	96.95
12	54	34.723	35.626	97.47
13	47	38.366	40.276	95.26
14	65	39.287	44.786	87.72
15	51	44.671	50.994	87.60
16	24	45.109	55.219	81.69
17	7	48.079	59.343	81.15

(1) The John Worthy school is a school conducted by the Board of Education for the boys under sixteen who are committed to the bridewell by any of the justices, or police, or criminal court judges of the city of Chicago.

Ergographic Work.

		kg.-cm.	kg.-cm.	
9	2	144.4	205.6	70.03
10	10	198.4	235.0	84.51
11	24	211.9	267.7	79.15
12	54	235.4	297.8	79.04
13	47	294.6	359.2	82.01
14	65	300.0	423.8	70.78
15	51	349.2	513.5	68.00
16	24	366.3	584.7	62.64
17	7	422.9	651.4	64.92

Vital Capacity.

		cu. cm.	cu. cm.	
9	2	1675	1549	108.13
10	10	1673	1659	100.81
11	24	1694	1799	94.11
12	54	1953	1956	99.85
13	47	2098	2246	93.40
14	65	2203	2527	87.16
15	51	2409	2858	84.21
16	24	2541	3363	75.14
17	7	2750	3570	77.03

The anthropometrical measurements and comparisons given in this paper conclusively show that a man's stature is somewhat modified by environment and that mental development on the whole depends, in a measure at least, on the healthy, normal development of the body. It is an accepted truth that the work required of the pupil of average strength can not be done without injury by the pupil of less than the average strength. It should be the duty of the school physician to determine the cause of the weakness, whether it be from lack of nutrition, bad sanitation, sickness, or what not, and to suggest the remedy. By these anthropometrical measurements and medical inspection the pupils could be classified with respect to their physical abilities, placing those together who are physically able to do, without injury, the full amount of school work of their age; and making another division for those whose physical development makes it probable that they can not do this work without injury, and who, therefore, demand special care and watchfulness.

There is need of further investigations along this line. The statistics that have as yet been collected bearing on normal growth and development are few and not of the most satisfactory sort. These statistics have usually been collected from large numbers of children of a corresponding age, regardless of previous conditions of health, thus averaging the unhealthy with the healthy. More satisfactory conclusions could be obtained by collecting data from the same children extending through the period of their growth.

Every child on entering school should bring with it a certificate with brief statements of the diseases it has had, its general constitution, condition of eyes, ears, vertebral column, height and weight of body. This certificate should form the basis for the further observation of the child by the school physician.

In addition to the items usually kept in a school register, the following particulars should be inscribed:

1. Birthplace.
2. Nationality of parents.
3. Occupation of parents.
4. Causes of death and ages at death of parent or parents.
5. Height.
6. Weight.
7. Girth of chest.
8. Circumference of head.
9. Strength of arm.
10. Power of sight.
11. Power of hearing.
12. Breathing capacity.
13. Previous and hereditary diseases.
14. Imperfect development and deformities.

PHYSICAL DEFECTS.

Says Walter E. Magee, director of physical culture, University of California (1): "All acquired and many hereditary deformities can be remedied in the majority of cases by a systematic physical culture during the first twelve years of school life, but they are exceedingly hard to remedy when the pupil arrives at university age."

The defects commonly found in every school are the following: Head drooping forward, round shoulders, flat chest, and stooping, pigeon breast, loss of lumbar curve and lateral curvature of the spine, and hips too far forward.

Magee examined the pupils of a representative girls' school of San Francisco, and found that "33 per cent. were suffering from curvature of the spine, one-third of whom had entirely lost the lumbar curve, thus producing a corresponding deformity of the chest and shoulders; 50 per cent. required special work for flat or hollow chests or pigeon breasts, while only 17 per cent. could be permitted to take regular exercise without special work. Many of these deformities were not serious, but, nevertheless, they existed, and, had they not been taken during the growing period, would have certainly resulted seriously."

Says Dr. Hitchcock (2) of Amherst College: "We do not find more than one student in twelve who is defective when he enters, save in sight, or

(1) Northwestern Monthly, July, 1897, page 11.
(2) Northwestern Monthly, July, 1897, page 24.

hearing, or from smoking. Some measures are below the average, but these we calculate to change in a year's work in the gymnasium."

Dr. E. M. Hartwell (1) of Boston says: "General defects, i. e., deformities, arrested development—stunting—have not been comprehensively studied as regards the student class, so far as I know. As yet, we scarcely know how heavy, tall, strong or enduring the normal boy or girl should be, and much less what the proportion is of defectives and delinquents, as regards physique, in our schools and colleges."

Dr. Seaver of Yale (2) reports about 4 per cent. of men entering college with hernia, about 6 per cent. have lateral curvature, and of these about 60 per cent. have lateral tip of the pelvis of at least 10 mm.

Physical education is receiving much attention throughout the United States. It is deemed essential to a well rounded education. In all the large cities some attention is paid to physical exercise in the grades. In the high schools regular exercises under the direction of a special instructor are given. Colleges have gymnasia, baths, and so forth, and instruction is given by a specialist in that line. Some of these institutions have medical examiners to determine the state of health of the pupils and regulate the exercises to be given them according to their physical condition.

In 1885 Amherst College instituted a compulsory physical training course, and from that time on there was less absence from study on account of sickness than had been previous to making the course compulsory. What was done for eighty men through physical training, along with their studies, is shown in the following percentages of increase in the measurements during the four years' college course (3):

	Per Cent Gain.
In bone structure..	1.31
In muscular size	4.47
In vital organs	4.51
In bodily weight	7.42
In muscular power	24.90

The following statistics are taken from a report of 1895 of the department of physical education in the University of Wisconsin. The students were permitted to work in the gymnasium as they chose, the course not being compulsory. Towards the end of the college year, it being the second physical examination, the pupils were asked questions concerning the results of their physical exercise in the gymnasium. Seventy-five of these cards containing the answers were selected at random, and showed the following results:

The lowest average number of hours spent in the gymnasium was two per week, the greatest twelve. In answer to the question regarding improvement in health, five men answered "No," twelve stated that they ob-

(1) Northwestern Monthly, July, 1897, page 24.
(2) Northwestern Monthly, July, 1897, page 25.
(3) Dr. Denison, "Advantages of Physical Education as a Prevention of Disease," American Academy of Medicine, October, 1898, Vol. 3, p. 524.

served no change, while fifty-eight testified as to improved state of health and strength as a result of the season's work, sixty-five testified that they could study much better, twenty-two said that they could spend one hour in the gymnasium and do as much studying in the remaining three hours as if they had spent all four hours at their books.

Abundant evidence can be produced to prove beyond a doubt that physical exercise is not only helpful but essential to the greater number of students. Conceding the importance of physical exercise, it is more evident that medical inspection should be instituted.

The system of uniform education has been so frequently denounced for the reason that it does not take into account the inherent abilities of different individuals. George Sand characterizes "the enforcing of common studies after a general fashion upon all children alike as the blackest crime of the intellectual world." But what should be said in denunciation of a system of enforced physical education on all alike, regardless of constitutional differences? The least harm would be done by doing as is done in the grades with the course of intellectual studies—strike an average of the class—thereby giving too much for the weak and too little for the strong. Such a system of physical instruction would be ridiculous, even more so than the intellectual, for there is more opportunity for individual and independent work in physical exercise.

A thorough physical examination should be made by a skilled physician, that the student's general health might be ascertained, his weak parts found out, and corrective exercise prescribed. Measurements should be taken from all parts of the body and recorded, and strength tests should be given. The heart, lungs and various internal organs should be examined and all evidences of disease and physical imperfections should be taken into account in prescribing exercise.

Many of the leading colleges are requiring a rigid physical examination on admission, and subsequent examinations during the course. For instance, in the Teachers' College of Columbia University, New York, at the beginning of each year two physicians hold office hours at the college, and each student, new and old, of the Horace Mann School (which includes the high school, the grades and the kindergarten), and all the first and second year college students are examined by them. The third and fourth-year students and post graduates are admitted to the college upon presenting a physician's certificate to the effect that they are in good physical condition; but if they select a course in physical training they are required to be examined by the college physician. Exercise is prescribed for each pupil according to his limitations and possibilities.

The following is the examination blank to be filled out:

TEACHERS' COLLEGE.

Physical Examination.

Department........................ Class..............................

Full name ....

Home address ....

City address ....
Birthplace.............................. Date of birth......................
General health of father..
If dead, cause...
General health of mother..
If dead, cause...
Sisters, number ....
General health ....
If dead, cause...
Brothers, number ....
General health ....
If dead, cause...
State if any disease among ancestors likely to become hereditary............
Height ....
Sitting height ....
Weight, A ....
Weight, B ....
Girth, chest, A ....
Girth, chest, B ....
Girth, waist, A ....
Girth, waist, B ....
Hearing.............................. Age ....
Sight................................. Desk height ....
General appearance.................. Spine, normal ....
Lungs, capacity...................... Kyphosis ....
Insp. .... Lordosis ....
Palp............................. Scoliosis ....
Perc............................. Pulse ....
Ausc............................. Resp. ....
Heart Insp.......................... Defecation..........................
Palp. .... Micturition ....
Perc. ....
Ausc. ....

1. Menstruation ....
2. Any accidents? ....
3. Have you ever had a hernia? ....
4. Do you sleep well?.................. No. of hours...................
5. State any illness you have had...
6. Is the pupil in condition for both heavy and light gymnastics?...........
7. Is the pupil in condition to play basket ball?..........................

Examiner ....
Date ....

II.

DEFECTIVE EYE-SIGHT.

So far as I have been able to learn, Dr. Hermann Cohn was the first to make any extensive examination of the eye-sight of school children. He began in 1865 (1) to examine the children of thirty-three schools of his native city, Breslau, including its university. Out of 10,060 pupils of all grades he found that 1,004 were near-sighted, and only 28 per cent. of these had near-sighted parents. In the first half of the first school year .4 of 1 per cent. were near-sighted. At 8½ years of age there were 5 per cent., and at 17½ years there were 20 per cent. who were myopic. Thus it gradually increased through the seven biennial grades till 63.6 per cent. of those who had been in school fourteen years were near-sighted.

Dr. Cohn, in 1867, found myopia among the university students as follows:

Fifty-three per cent. of the Catholic theologues.

Fifty-five per cent. of the law students.

Fifty-six per cent. of the medical students.

Sixty-seven per cent. of the Evangelical theologues.

Sixty-eight per cent. of the students of philosophy.

In 1880 he examined the medical students of the university and found "that 52 per cent. of those who had not passed the 'examen physicum,' 64 per cent. of the candidates who had already stood the examination, were myopic."

In 1871 Dr. Cohn examined the pupils of the Friedrichs Gymnasium, at Breslau, and repeated the examination upon the same pupils three semesters after. Seventeen of the pupils who had normal sight at the first examination were short-sighted at the second, and more than half of those who were found near-sighted at the first examination were found to be more so at the second. From his examination Dr. Cohn deduced the following laws:

1. Short-sightedness hardly exists in the village schools; the number of cases increases steadily with the increasing demands which the schools make upon the eyes, and reaches the highest point in the gymnasia.

2. The number of short-sighted scholars rises regularly from the lowest to the highest classes in all institutions.

3. The average degree of myopia increases from class to class; that is, the short-sighted become more so.

These laws have been confirmed says Dr. Cohn, by "more than thirty accurate reports of competent oculists, giving the results of the most careful investigations among more than forty thousand scholars."

Dr. Cohn further says: "If we inquire into the bearing of nationality and the development of the affection, we find that in the gymnasia at Upsala 37 per cent., at St. Petersburg 31 per cent., at Dorpat 55 per cent., at Lyons 22 per cent., at Tiflis 37 per cent., at New York 27 per cent., at Boston 28 per cent. of the students are myopic. In the gymnasia at St. Petersburg 34 per cent. of the Russian and only 24 per cent. of the German scholars;

(1) "Eyes and School Books," Popular Science Monthly, Vol. 19, p. 54 ff.

at Tiflis 30 per. cent. of the Russians, 38 per cent. of the Armenians and 45 per cent. of the Georgians, were near-sighted. Of 529 teachers in Lucerne, 14 per cent. of the Latin Swiss and 24 per cent. of the German Swiss were affected. Loring and Derby observed in New York, in 1876, that 14 per cent. of the children of Irish, 20 per cent. of Americans and 24 per cent. of German parents were near-sighted. At the International Congress of Physicians, held in Paris in 1867, I confidently addressed every one who wore spectacles in German, and was sure to receive an answer. The statements of all the authorities establish, however, that everywhere, and in all institutions, the number of myopes increases from class to class and becomes really formidable in the secunda prima of the gymnasia and real schools, and the corresponding classes of other schools. It ranges at between 35 and 60 per cent. of the whole number of scholars; but the proportion has been found to exceed 60 per cent. in the prima of several German gymnasia, and to rise to 80 per cent. at Erlangen and 100 per cent. at Heidelberg. Taking the average of the results of the examinations in twenty-five German and Swiss gymnasia, with 9,096 scholars, the percentage of short-sighted pupils rose from the sexta to the prima as follows: 22 per cent., 27 per cent., 33 per cent., 46 per cent., 52 per cent., 53 per cent." (1.)

The eyes of the Munich school children were investigated by Dr. Seggel (2). According to the Munich "Med. Wochenschr," he found in six public schools normal acuteness of vision in 60.7 per cent. of the boys and 54.3 per cent. of the girls. As far as refraction is concerned, he reports: Emmetropia, 64 per cent.; hypermetropia, 22.4 per cent.; myopia, 3.6 per cent.; astigmatism, 7.8 per cent.; other anomalies of the eyes, 2.1 per cent. In the middle schools the percentage of short-sightedness was as follows:

In the I class, fifth school year, 16.5 per cent.

In the II class, sixth school year, 24.5 per cent.

In the III class, seventh school year, 29.0 per cent.

In the IV class, eighth school year, 35.2 per cent.

In the V class, ninth school year, 40.6 per cent.

In the VI class, tenth school year, 46.4 per cent.

In the VII class, eleventh school year, 52.1 per cent.

In the VIII class, twelfth school year, 54.0 per cent.

Dr. Agnew (3) of New York, assisted by others, collected statistics as follows: "New York College, 549 students; introductory class, near-sighted. 29 per cent.; freshman. 40 per cent.; sophomore. 35 per cent.; junior. 53 per cent.; senior, 37 per cent. Brooklyn Polytechnic, 300 students: academic department, 10 per cent.; collegiate, 28 per cent. Cincinnati, 630 students: district schools, 10 per cent.; intermediate, 14 per cent.; normal high, 16 per cent."

In 1877 Dr. Lucien Howe made an examination of 1,003 scholars of the public schools of Buffalo. He found 20 per cent. of these to be near-sighted and 12 per cent. to be over-sighted. No case of near-sight was found

(1) "Eyes and School Books," Popular Science Monthly, Vol. 19, page 56.
(2) Zeitschrift für Schulgesundheitspflege, 1894, page 284.
(3) "Effects of Study and Eyesight," Popular Science Monthly, Vol. 12, p. 74 ff.

among children 6 years and under. At 7 years, 5 per cent. were near-sighted; at 11, 11 per cent.; at 13, 19 per cent.; at 18, 26 per cent.; at 21 and over, 43 per cent.

Dr. Risley (1) of Philadelphia says: "Many a boy who gets on indifferently at school, gaining a reputation for dullness or indolence, is prevented from going forward by his imperfect vision—a condition of which he may himself be ignorant. How is the child to know but that the blurring page, the watery eyes, the aching head, which follow any protracted use of the eyes, are not the common lot of mankind? This has always been his experience; why should it not be of his fellows also?"

Risley observes that in 2,422 children examined by himself in Philadelphia, 1,084 were found to have less than the normal acuity of vision, and that 1,099 had more or less trouble arising from the use of their eyes at books. The images are imperfectly made on the retina. The pupil strains to correct this defect and the strain distorts the ball and causes astigmatism, hypermetropia and myopia. The course should be somewhat elastic to enable those who are capable of doing a part but not all to do what they can.

West (2), on testing the school children of Worcester, Mass., in 1891, "found that out of 793 boys, 308, or 38.84 per cent., and out of 602 girls, 313, or 52 per cent., were short-sighted."

Table showing the percentage of defective sight by grades in Worcester.

Grade	I.	II.	III.	IV.	V.
Boys	35	52.7	52.7	38	41.6
Girls	31	67	67	48	51

From the fifth grade it declines steadily to the ninth, where it is 18 per cent. for the boys and 24 per cent. for the girls. The pupils were also classed "with respect to the amount of weakness of sight found in each sex, and finally with respect to the amount of weakness displayed by each of the eyes. Among the boys 46.5 per cent. were between .62 and .85 of the normal strength, 24.2 per cent. were between .50 and .62 of the normal, while 30.25 per cent. were below this.

Among the girls the percentages were 47.8 per cent., 24.25 per cent., and 28 per cent., respectively. Among the boys both eyes were defective in 53.77 per cent., in the right eye in 19.6 per cent., and the left eye in 26.63 per cent. of cases. For the girls the figures were 56.58 per cent. for both eyes, 20.55 per cent. for the right eye, and 22.86 per cent. for the left eye."

In 1876 Dr. Loring, Jr., and Dr. Derby (3) of New York examined 200 pupils of the Twelfth Street public school and the Normal school on Sixty-sixth street, New York. This report confirmed the report of others that myopia was found to affect a small percentage the first year and gradually increased yearly thereafter to the end of school life.

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(1) "Defective Vision in School Children," Ed. Review, April, 1892, Vol. III, page 348 ff.

(2) "Eye Tests on Children," American Journal of Psychology, Vol. IV, pages 595-6.

(3) McLean, "Effects of Study on the Eyesight," Popular Science Monthly, Vol. 22, page 74.

In the fall of 1875 Dr. Haskel Derby (1) of Boston began a series of examinations at Amherst College with a purpose of noting the progress of myopia in the same class and the same individuals. He found 27 per cent. of the freshman class and 28 per cent. of the sophomore class to be near-sighted. His examination of the same students a year later showed a progress of the disease in one-half of the number previously found to be myopic. In 1877 he examined the eyes of 122 volunteers from the freshman class of Harvard College and found 29½ per cent. to be myopic.

COMPARATIVE CLASSES AS TO MYOPIA.

Dr. Cohn examined the eyes of many peasant children "living in a state of comparative simplicity and having little or no occasion to tax or strain the sight," and found that scarcely 2 per cent. were near-sighted.

Examinations of the children of factory operatives or artisans of England show a very low percentage of myopia.

Dr. Howe says: "Of 213 cases of eye diseases seen during the last year among the paupers of Buffalo, the record shows only 3½ per cent. to have been near-sighted."

Donders noticed the difference between his private patients and his hospital patients. His private patients representing the well-to-do class had a higher percentage of near-sight than the hospital patients who represented the poorer class of people. Oversight was distributed nearly equally between the two classes.

Dr. Peter A. Callan examined 457 colored school children, aged from 5 to 19 years, in New York, and found but 26 per cent. of near-sight among them. This seems to show that there is a hereditary tendency to myopia among those who have for generations been readers of books. Conclusions from these investigations, covering about 2,600 pupils, are:

1. That, as a rule, near-sight originates in school life.
2. That a large per cent. of the scholars are thus afflicted, the percentage progressing with the stage of advancement in study.
3. That near-sight is progressive in degree, according to the length of school experience.

Dr. Howe found that "in schools where the hygienic conditions relating to the position of the pupils and the amount of light are disregarded, the proportion of near-sighted pupils grows larger; and, conversely, where these relations are observed, the number diminishes."

As early as February, 1877, Dr. Loring advocated the examination of school children when they entered school and at frequent intervals afterward. By such an examination the position of a pupil's seat to the blackboard and light, and whether glasses should be recommended, would be determined.

(1) McLean, Popular Science Monthly, Vol. 22, page 74 ff. (Authority for all statements on this page.)

Dr. D. N. Alcorn (1) of Stevens Point, Wis., examined the eyes of over 340 students in the Normal school and pupils in the model department.

He examined each eye separately, and his report shows some affection of sight, often very slight, in almost every pupil, though about 50 per cent. of them had normal vision, notwithstanding the defect, that is they could read letters 13 millimeters square at 20 feet. Classifying the pupils examined according to the department to which they belonged, showed the greatest defectiveness in the normal department, less in the grammar department, and least in the intermediate and primary. His report also shows that the extent of affection is greater in the older pupils, there being few serious defects among the youngest pupils.

The effect of sight on the general health seems to be marked. "Jessup reiterates the well known fact that persistent and recurring headaches in young persons and in those near the presbyopic age are in many cases due to an error of refraction, weak accommodation and anomalies of the extrinsic muscles. Mittendorf reports 4,000 cases of headaches that were relieved by the correction of optical defects. Coover details fifteen cases of reflex irritation following eye strain. Among the prominent symptoms, all relieved by full correction, are attacks of convulsions resembling epilepsy, caused by the continued use of the eye at the near point, headaches, vertigo, nausea, constant pains over the brows and occiput, restlessness, loss of appetite, faintness, insomnia, palpitation of the heart, chorea, stammering, cough without expectoration, irritation, thickness of speech and numbness of the hand and tongue, mental confusion, backaches and dyspepsia" (2.)

A system of inspecting the eyes of school children was instituted in Minneapolis in 1896 (3). A somewhat detailed description of the plan is here given as an example of how it may be successfully accomplished without being a financial burden to the district. The principals are to test the eyes of the children. An oculist is to be employed by the board of education, whose duty it is to lecture to the principals upon the elementary facts in ocular anatomy, physiology and hygiene, and upon the uses and application of the test types, etc. He is also to illustrate the method by practical demonstrations. The principals are each provided with a Snellen test card and printed instructions. The cost need not exceed $75 for a city of 200,000 people.

On the statistical blanks used in Minneapolis schools the following instructions for eye examination are printed:

"The examination should be made privately and singly, in a room apart from the general school session.

"Place a card of Snellen's Test Types on the wall in good light; do not allow the face of the card to be covered by glass.

"The line marked XX (20) should be seen at twenty feet, therefore place the pupil twenty feet from the card.

(1) Swift, "Eye Defects in Students and Children," Ped. Sem., Vol. 5, p. 202.
(2) "The American Year Book of Medicine and Surgery," 1897, page 893.
(3) "Defective Eyesight in American School Children," Review of Reviews, Vol. 15, June, 1897, page 694 ff.

"Each eye should be examined separately.

"Hold a card over one eye while the other is being examined. Do not press upon the covered eye, as the pressure might induce an incorrect examination.

"Have the pupil begin at the top of the test card and read aloud down as far as he can, first with one eye and then with the other.

"If the pupil can read XX (20) test type with each eye and does not, upon inquiry, complain of tired and painful eyes or headache, his vision may be considered satisfactory; but if he cannot read XX (20) test type with both eyes, or complains of tired and painful eyes or headache, a card of information should be sent to the parent or guardian.

"Please examine your entire school by this method, but only such pupils as are thought necessary to send to an oculist need tabulation in this blank.

"May 1st of each year please complete this report and send it to Dr. C. M. Jordan. superintendent of schools, and a duplicate to Dr. Frank Allport.

"This will afford you opportunity to examine your pupils, to note if they follow your suggestion with regard to consulting an oculist, and, if so, to observe the effect upon the pupil's conduct, health, application to study, etc., etc., which you will please carefully, but briefly, note in the proper place in this sheet."

The blank has columns headed as follows: "Name," "Sex," "Age," "State number of last line seen by pupil with right eye," "Last line seen with left eye," "Do the eyes and head grow weary and painful after study?" "Did pupil consult an oculist and follow advice?" "Briefly describe the results of treatment."

The following warning is sent by the principal to the parents when necessary:

"Dear Sir:

"Your child's eyes have been examined by me this day. I believe it advisable to consult a physician of recognized standing. Some eye doctor recommended, and if you feel unable to consult one at his office, a dispensary will do the work free of charge."

The report (1) of the first year's examination shows that 25,696 children were tested, of whom 8,166, or 32 per cent., were deemed defective. Among these 6,451 eyes were found possessing a vision of 20-30, or a little worse than normal; 2,257 eyes had a vision of 20-40, 1,214 a vision of 20-50, 1,130 a vision of 20-70, 745 a vision of 20-100, 447 a vision of 20-200, and forty-three eyes were practically blind; 4,472 children could not use their eyes to a reasonable extent without eye-tire, headache, etc. The percentages of defectiveness in the different schools ranged from 11 to 67 per cent., the higher percentages being found in the poorly lighted and unsanitary buildings.

Brundenell-Carter (2), in London, has reported to the educational council concerning the eyes of 8,135 school children in that city. He found that only

(1) Allport, "Tests for Defective Vision in Schools," Ed. Review, Vol. 14, September, 1897, page 156.
(2) Zeitschrift für Schulgesundheitspflege, 1896, page 609.

39.15 per cent. possessed normal vision. The most common failing was light hypermetropia. Myopia did not often occur, and both in frequency and degree was less among boys than among girls.

Dr. Crichton Browne (1) examined 6,580 children in the London schools as to short-sightedness and found 367, or 5.6 per cent. afflicted with the malady. He found 2.5 per cent. to be short-sighted in the first standard, which increased through the six standards as follows: 3.6 per cent., 5.8 per cent., 8.5 per cent., 8.4 per cent., 9.2 per cent. He examined them also as to squints, and found 2.5 per cent. with that affection.

The General Assembly of Connecticut for 1899 passed the following law:

"Section 1. The state board of education shall prepare, or cause to be prepared, suitable test cards and blanks to be used in testing the eyesight of the pupils in the public schools, and shall furnish the same, together with all necessary instructions for their use, free of expense, to every school in the state.

"Sec. 2. The superintendent, principal or teacher in every school, some time during the fall term in each year, shall test the eyesight of all pupils under his charge, according to the instructions furnished, as above provided, and shall notify in writing the parent or guardian of every pupil who shall be found to have any defect of vision or disease of the eyes with a brief statement of such defect or disease, and shall make written report of all such cases to the state board of education."

In accordance with the provisions of this act, the state board employed S. B. St. John, M. D., of Hartford, to prepare instructions for intelligently making the tests required by law, and the form of reports to parents and the state board of education. These instructions, accompanied with complete charts, were sent to the various districts in the state. The results have not been tabulated.

In 1899 the board of education of Colorado Springs, Colo. (2), instituted a system of inspecting the sight and hearing of school children. A specialist was employed to instruct the principals in the method of making the tests, and the work was performed by them. The tests were made only for ability to read the type at proper distances. No tests were made for astigmatism, and so the number of defective eyes is much greater than the figures show. Two thousand four hundred and one pupils were tested, and 655, or 23 per cent., were found to be defective in one or both eyes.

Of this number of children with defective eyes, 334 had eyes of unequal strength. Many of these varied greatly, thus causing much strain on the eyes to get along at all. A notice is sent by the teacher to the parents, stating that an oculist should be consulted.

The ear tests reported on 1,293 cases showed 160, or about 12 per cent., defective in hearing. Many simply had hardened wax in the ear.

(1) Report on Elementary Schools by Dr. Browne, page 31.
(2) From notes of Dr. E. G. Lancaster.

In 1899 a system of inspecting the eyes of school children was instituted in the Cleveland public schools (1). The work of inspection is being done by the teachers with the following results:

During 1900 correct reports (above first grade), included 30,045 cases examined, of which 6,221, or 20.7 per cent., were reported as having defects. During 1901 correct reports (above first grade) included 32,939 cases, of which 6,169, or 18.7 per cent., were reported as having defects. In 1901 only new pupils to the Cleveland schools and those whose eyes were reported as defective were examined. Of the 6,221 cases found to have defective vision in 1899 and 1900, 938 were reported as wearing glasses at the beginning of the school year, and 1,634 were reported as wearing glasses by February 15 (date of report). Thirty-nine thousand and forty-three cases examined in 1900 and 1901 give the following per cents. for the respective grades: Grade 1, 11.2; 2, 16.3; 3, 18.6; 4, 18.5; 5, 19.4; 6, 20.4; 7, 18.9; 8, 20.4.

In the spring of 1900, under the direction of an oculist, the teachers of Milwaukee (2) examined the eyes of 19,618 school children. Of these 5,055 (25.75 per cent.) were found to have defective vision.

The report of the Department of Child-Study and Pedagogic Investigation of Chicago for 1900 (3) contains the summary of the results of testing the eyes of 4,765 pupils—2,030 boys, 2,735 girls. They were tested in the usual manner with the ordinary Snellen's type. Thirty-five per cent. of all the pupils tested were found defective—37 per cent. of the girls and 32 per cent. of the boys. The per cent. rapidly increases in the first three years of school life, suggesting that the school work of that period is hard on the eyes of the pupils. The lowest per cent. of defectiveness is found between the ages of 13 and 14.

In comparing sight and school standing it is found that there is a greater percentage of defectiveness among the pupils below grade than among the pupils at or above grade, except pupils at the age of 8 and 9, when the reverse is true, and a still higher percentage of defectiveness among the John Worthy pupils.

Systematic eye tests have also been made by the teachers in Denver, Los Angeles and Pawtucket (sight and hearing).

III.

DEFECTIVE HEARING.

Defective hearing is doubtless the cause of much apparent inattention and stupidity on the part of pupils. Often, very often, no one knows that there is any defect, not even the pupil himself is aware of it, until a test is made. It is perfectly natural for the pupil to think that he hears as well as others, for he has had no comparisons with normal children to point

(1) Annual Report of the Board of Education, Cleveland, 1901.
(2) Annual Report Board of School Directors, Milwaukee, 1900.
(3) Report of the Department of Child-Study and Pedagogic Investigation. Reprint from the 46th Annual Report of the Board of Education of Chicago, 1900.

out his defect. His lack of ready response is laid up against him as stupidity, and even sometimes as perverseness, when it is due to his not hearing distinctly what is told him. The parent or teacher thinks his hearing not at fault because at times he probably hears much better than at others, which is true with most cases of bad hearing. Also, one ear may be defective while the other is not; and when the good ear is turned to the speaker perfect hearing is experienced and prompt response is had, whilst when the defective ear is turned his lack of ready response is attributed to inattention, disobedience, or even stupidity.

The following are some of the tests and their results that have been made on school children:

Dr. Sexton (1) examined 570 children in the schools of New York City, and 76 were found defective in one or both ears. Of all these 76 pupils only one was known by the teacher to be defective, and only 10 knew themselves to be deficient in this sense.

At Terre Haute, Ind., Dr. J. P. Worrell examined 491 school children from 6 to 15 years of age with the following results: Seventy-two having both ears impaired, 53 having one ear impaired, making a total of 125 with impaired hearing. But three of these 125 were known by the teacher to be hard of hearing. The ages of those with a high degree of impairment of hearing were compared with the average ages of their respective grades, and it was found that those with bad hearing were older than the average of their grade, and generally larger.

Dr. Barr examined 600 school children of Glasgow, Scotland. Their ages ranged from 7 to 14, and were an equal number of boys and girls. He found 166 to be defective in hearing. After his tests were made, Barr asked the teachers to select 70 bright pupils and 70 backward pupils. He examined these and found 14 of the bright and 28 of the dull ones to be defective in hearing, thus confirming the supposition that the dull ones in our schools are the defective ones.

Moure examined at different times, about 1881 and 1883, 3,588 school children in Bordeaux, and found 616, or more than 17 per cent., to be defective in hearing. He claimed that at least 500 of the 616 children could be cured of their deafness if properly treated, but if left to themselves to adult age they would all be more or less deaf. These children were of both sexes and from 5 to 14 years of age.

Gelle found from 20 to 25 per cent. of all the children in an orphan asylum, from 7 to 14 years of age, defective in hearing. The most of these cases were pointed out by their teachers as dull, lazy and absent-minded. He also examined the hearing of pupils in schools of the first order in Paris. He selected those who were considered dull and bad and frequently needing punishment. A very large per cent. of these were found to be defective to a greater or less degree in hearing.

"Among twenty of the foremost pupils in four classes in a school there were but six who heard the watch at less than 50 centimeters, whereas

(1) Chrisman, "Hearing of Children," Ped. Sem., Vol. 2, pp. 403, 404, 405.
(Authority for all statements on this page.)

among twenty of the lowest pupils in these same classes there was not a one that heard the watch at more than 50 centimeters. Among twenty foremost pupils in another school, three only heard below 50 centimeters, but twenty of the lowest pupils of the same school had seventeen among them who heard only at 50 centimeters or less."

A child who imperfectly hears is uncertain, hesitating and doubtful, as is shown by the inaccuracy of the work performed. One may not hear at all at a certain distance and hear perfectly at a shorter range. A girl who did not hear at all at 7 m., heard inaccurately at 5 m., but heard quite correctly at 4 m.

The results of Gelle's investigation in general show that about 25 per cent. of all the pupils have defective hearing; that there are fewer defectives among the bright pupils in a class than among the dull ones, and that among those whose range of hearing does not reach the limit of those with normal hearing, the advancement of the various pupils is generally in proportion to the limit of the range of hearing; or, in other words, the greater the impairment of hearing, the duller the pupil.

Weil (1) examined the hearing of 5,095 children, 3,228 boys and 2,677 girls, of Stuttgart. These children were from schools ranging from the elementary schools to the college, and therefore represented all classes of society. Great pains were taken to insure accuracy. He found about 30 per cent. who could not hear correctly at the normal range, the degree of deafness varying greatly in different pupils.

Weil concluded that the results of his investigations show better hearing in the schools attended by the better class than those frequented by the poorer class, and that younger children hear better than older ones. Weil firmly believes that the pupils hard of hearing are misjudged and considered inattentive. He believes that many of the children whom he examined could be entirely relieved in a few minutes.

Bezold (2) examined 1,918 children of the schools of Munich; 629 of these were almuni of the Ludwigs gymnasium, and give the following results: Twenty-five and eight-tenths per cent. possessed one-third or less of the normal hearing distance. Fourteen and five-tenths per cent. of the whole perceived whispered speech, heard by the normal ear at 20-25 m., only at 8-4 m., and 11.3 per cent. of the whole heard the whisper only between 4-0 m.

Reichard (3) of Russia, in 1878, published a paper on defective hearing. He had examined 1,055 school children and found more than 22 per cent. of them with less than the normal acuteness in hearing. Reichard observed that hearing was much better among the Slavonic race than among the Germanic. He thought the difference was due, not to race, but to the superior care and culture of the skin among the Slavs, who make greater use of the bath tub than the Germans do.

The difference was shown in the comparison of the children from two schools. The one school was situated in the suburbs. "These children

(1) Chrisman, "Hearing of Children," Ped. Sem., Vol. 2, page 409.
(2) Ib.
(3) Ib.

showed by their lean, flabby appearance, paleness of skin, often dull expression of countenance, slovenly dress, uncleanliness of hands and face, disorderliness of their hair and a disagreeable smell which clung to them that they were cellar dwellers." Over 40 per cent. of these were found to be deficient in their acuteness of hearing. The other school, situated in more healthful surroundings and attended by pupils from better homes, showed the highest degree of accuracy in hearing.

Lunin (1) examined the ears of 281 students of a female school in St. Petersburg in respect to sharpness of hearing. Their ages were from 8 to 20 years. He found the percentage of defective hearing to be 19.5.

In reference to the influence of bad hearing on the mental development and progress of the pupils so affected, Lunin gives the following data: "Of 226 students who heard whispering with both ears at 16 meters or more (being normal ears), 119 had a record for good work, 84 satisfactory and 23 bad. Of 43 hearing in one or both ears from 16 to 8 meters, 11 had a good record, 20 fair and 12 bad. Of 12 hearing in one or both ears from 8 to 0 meters, 1 had a good record, 5 fair and 6 very bad. Thus is shown that the more deficient the hearing the poorer the pupil is in his work. Also deficiency of hearing has great influence upon the character of the pupil, often causing him to become obstinate and ill disposed. Even if he tries to follow the instructions of the teacher, his hearing prevents. These hard-hearing ones are generally considered lazy, inattentive and dull by their teachers."

Zhermunski (2) received permission from the commissioner of education of Russia to investigate the condition of hearing among the school children of St. Petersburg. He examined 2,221 children, 1,318 boys and 903 girls, from 7 to 11 years of age, and in fifty different schools 388 pupils—221 boys and 167 girls—or 17.42 per cent. were found to have diseased organs. He thinks that over 80 per cent. of these could be completely healed by proper treatment.

He expresses the effect of hardness of hearing on the mental standing of the pupil by the ratio of satisfactory to unsatisfactory as follows:

"In pupils hearing the whisper in both ears from 24 to 12 m., the ratio of the satisfactory to the unsatisfactory is 4.19 to 1; those hearing from 12 to 8 m., the ratio is 2.6 to 1; from 8 to 0 m. is 1.7 to 1."

Schmiegelow (3) examined 581 school children of Copenhagen of both sexes, in age from 8 to 14. According to his reckoning of the proper range of normal hearing, more than 50 per cent. were either in the class of "bad hearing" or "defective hearing." After making the tests he asked the teachers to select those pupils who were "poorly gifted." They designated 79 pupils whom they considered backward. "Of these 79 children, 15 had a reach of hearing (whispering) of below 2 m., 36 from 2 to 4 m., and 28 only exceeded 4 m." Thus 51, nearly 65 per cent. of the 79, had defective hearing. His investigations showed that the worse the hearing the more "poorly gifted" they were.

(1) Chrisman, "Hearing of Children," Ped. Sem., Vol. 2, page 415.
(2) Chrisman, Ibid, pp. 420, 423.
(3) Ibid, pp. 420, 423.

Superintendent Seaver of the Boston schools, in a letter to the writer on November 10, 1899, said: "I agree with you in thinking that the eye-sight and hearing of children should be carefully investigated. Instances that come within my own observation prove that dullness of brain is imputed to children when it is only defective vision or defective hearing. I have no data collected bearing on this phase of the subject. I can only say that many cases have been discovered and remedied by proper treatment, given either by the family physician or at the hospital."

The Department of Child-Study and Pedagogic Investigation of Chicago (1) tested the hearing of pupils by means of the audiometer, invented by Prof. C. E. Seashore of the Iowa State University. This is an electric apparatus, well adapted to school tests, and is reported as being the best means yet invented for making such tests. It is fully described by Prof. Seashore in Studies in Psychology, Vol. II., issued from that University.

The per cents. of defectiveness of 5,706 pupils thus tested are shown in the following table:

	Three or More Points Below Normal.	Four or More Points Below Normal.	Five or More Points Below Normal.
With one ear...	25.3 per cent.	16.8 per cent.	12.2 per cent.
With both ears.	12.3 per cent.	6.8 per cent.	3.2 per cent.

From this table it appears that there is a large number of pupils whose two ears differ in hearing power. These will be at a decided disadvantage if seated on the wrong side of the room.

The report further shows that the percentage of defectiveness rapidly increases for the first three years of school life and again decreases. There is very little difference between the sexes in the matter of hearing, and the pupils of the John Worthy school show no striking difference from the pupils of the other schools.

IV.

INFLUENCE OF SCHOOLS IN SPREADING CONTAGIOUS DISEASES.

It will hardly be contradicted that the school room is a most fruitful place for the spread of contagion. Simply being confined in the same room is of itself conducive to this end. Any defect in the ventilation or sanitation of the room renders it more so. Children are prone to handle each other's pencils, erasers, etc., and through touch actually convey to each other any germs of disease that one may possess. They are often in school during the inception and development of the disease before any one suspects that there is anything the matter. Often children are returned to school before they are free from contagion. And still others may have a light and overlooked attack of the contagious disease and not be sick enough to stay away from school.

(1) Report of the Department of Child-Study and Pedagogic Investigation. Reprint from the Forty-sixth Annual Report of the Board of Education of Chicago, 1900.

Statistics of all the cases of diphtheria and scarlet fever collected in the state of Michigan, extending over periods from 1877-81 and from 1887-91, have been averaged by months and a curve traced showing the relation of these diseases month by month. The month of August shows a marked increase of sickness from these diseases, and the following month of September shows a still greater increase. The increase in August is doubtless due to climatic conditions, but the additional increase in September is believed to be due to the opening of the schools.

The Boston board of health, in 1897, published a table showing the number of diphtheria cases reported each month in 19 years, and the number of scarlet fever cases reported each month for 20 years. The sum total for the two vacation months, July and August, of diphtheria was 3,638 cases, and of scarlet fever 2,497 cases. The greatest number for any two months, being the school months of November and December, was 7,972 of diphtheria and 5,531 of scarlet fever. The least number reported for any two school months, being in September and October, was 5,512 cases of diphtheria and 3,604 of scarlet fever. Thus there were reported in the months of July and August 1,874 fewer cases of diphtheria and 1,107 fewer cases of scarlet fever than in any two months when school was in session.

Dr. Berger (1), who has made some investigations as to the influence of the different seasons of the year upon contagious diseases, concludes from these investigations that diphtheria among school children, as well as among others, is most frequent in the winter months, rarest in the summer months—June and July showing the fewest cases and January and February showing the most. Scarlet fever is most common in the winter months, and from March to July having the fewest cases. Measles occur most frequently in the winter months, but typhoid fever is most frequent in August and rarest from November to February. But whilst the conditions of the weather influence the spread of these diseases, it has been shown that the school is an important factor in the spread of contagious diseases.

The German physician, Koeroesi (2), investigating this subject, found for the three months of vacation only 3,054 cases of measles, for the first three months of the school year, 11,865; for the second three months of school, 13,258, and for the third, 13,147. A still more striking proof that the school is a factor in spreading contagious diseases is found in the fact that the time for vacation was changed one year on account of cholera, when the number of cases correspondingly decreased during the vacation.

Murphy (3) of London made investigations in the years of 1892-93 and shows similar results, especially for scarlet fever and diphtheria for the ages from 3 to 13, there being comparatively few cases during the summer vacation.

Dr. Schaefer (4) compiled statistics in regard to contagious diseases from the reports of Schleswig-Holstein and Hamburg for measles, scarlet

(1) Zeit. f. Schul., 1898, No. 1, page 26.
(2) Ped. Sem., Vol. VII, April, 1900, page 82.
(3) Ib.
(4) Ib., page 83.

fever, diphtheria and whooping cough for some sixteen years. His curves for scarlet fever and diphtheria show a decided sinking for the months of the summer vacation. The curve for measles reached its highest point in June, gradually falling till it reached its lowest point in August. The curve for whooping cough rises to a marked degree in July and August.

Dr. Hodge of Clark University compiled statistics of contagious diseases from the reports of the city of Worcester for the years '93-'98. Each vacation shows a marked depression in the curve for each separate disease. This chart shows that the curve for measles has a marked rise every three years, resulting in an epidemic. This is due to the fact that a child having had the measles once is immuned from the disease, and another epidemic cannot occur until there are more children born and a considerable number of the population become susceptible.

V.

MEDICAL INSPECTION OF SCHOOL CHILDREN.

If it is of sufficient importance to care for the physical well being of students attending the colleges and universities, it may well be asked, Is it not of equal importance in the high schools and in the grades? So far but few cities have any system of medical inspection of school children, but those that have instituted a system, and the tests that have been made, furnish statistics which show conclusively its value.

HISTORICAL.

As regards the history of investigations on the subject, it may be said that Peter Frank, in his "System einer vollstandigen medizinischen Polizei" (1), made not only the external arrangements of the school, but also the instruction the object of a somewhat detailed examination.

Lorinser, in 1836, published "Zum Schutze der Gesundheit in den Schulen," which attracted more and more the attention of the physicians to the matter. Also investigations in school hygiene were commenced in Sweden, in consequence of which the school hour was lessened in the year 1832, after gymnastics had been introduced in 1828 as a preventive against mental over-exertion.

Poppenheim, in 1858, made the demand for sanitary supervision of schools, and others in Prussia followed, viz., Faek, Alois, Gruber, Forquahr, Hermann Cohn, Baginsky, Wasserfuhr and others.

In 1869, at a Natural Science Association held in Innsbruck, it was recommended that a physician should be a member of each school board in a community.

At the Natural Science Association in Breslau, in 1875, and in Graz, in 1876, it was evident that in the meanwhile the school men had taken a position in reference to the school physician question; likewise the governments of the individual states: Württenberg, 1870; Baden and Elsass, 1876, then Hessen, and still later Prussia, 1884.

(1) Zeitschrift für Schulgesundheitspflege, 1897, page 193 ff.

Hermann Cohn gave an extraordinary impetus to the movement in 1882, but probably made too heavy demands to be immediately practicable.

At the International Hygienic Congress, held at Vienna in 1887, Cohn and Wasserfuhr proposed some practical theses which might serve as a foundation to an introduction of medical inspection, which were adopted.

In Württenberg medical inspection was officially introduced in 1875. It had official connection with the board of health.

In Stuttgart and in Frankfurt a. M., the school physician is invited regularly to all sittings of the city school authorities and takes part in their discussions, although with only advisory power. Further regular monthly conferences of the chairmen of the school board, of the city council, and of the city physician were instituted in which questions pertaining to school hygiene were freely discussed.

In Leipzig since 1892, 15 school physicians are appointed for every 4,000 or 5,000 school children. These physicians work with such reserve and caution that the teaching body perceive only the fruit of their labors.

School physicians are appointed in Berne, Basel, Lausanne, Neuchatel and elsewhere in Switzerland. Also in Austria, Hungary, France, Belgium, Holland and England are school physicians; and in Edinburgh, a male and a female school physician are appointed. It is evident that Sweden is not behind in the movement since the first investigations in school hygiene were instituted there.

In Prussia a statute for the intermediate schools requires that a physician shall be appointed for each of these schools, whose duty is to inspect both the school and the scholars. Since 1887 the physicians have the right to vote on hygienic questions in the sessions of the school boards. In Moscow, in 1888, two school physicians were appointed for the female Gymnasien.

Dr. Mishima, in a letter to the publisher of the "Zeit. f. Schul," informs us that Japan since 1893 has had school physicians.

In Prussia according to the statement of Dr. Edel in the "Zeit. f. Schul," 1897, it is the duty of the physicians to investigate the schools in the towns where they reside and also other schools within the district of their practice. These investigations are to be reported to the school authorities. The physicians, however, are mostly only in the position to investigate the schools as buildings, whilst they come in contact with the school children only with reference to vaccination. These provisions have been of little avail; for often the physicians have no opportunity to examine the children, or nothing is said in their reports concerning the scholars, or the only remarks in reference to them are those bearing on infectious diseases. Only here and there is an individual physician's report concerning school investigations which gives anything in reference to the diseases of the scholars, as for instance, that of Dr. Langerhans and a few others. The statutes of 1884 require the physicians to report on contagious diseases of school children. According to an ordinance of the city of Breslau of 1887, physicians of good repute are to be called in for council for all new school arangements, including new buildings and repairs.

Provisions are made in the school administrations of the following cities in Prussia for children who are not gifted with ordinary intelligence and who are of a school age: (1)

Königsberg in Pr., Brandenburg, Charlottenburg, Guben, Stettin, Breslau, Görlitz, Magdeburg, Halberstadt, Halle a. S., Erfurt, Nordhausen, Altona, Hanover, Göttingen, Lüneburg, Dortmund, Kassel, Frankfurt a. M., Düsseldorf, Krefeld, Elberfeld, Essen, Köln and Aachen. With the exception of Brandenburg, Guben, Magdeburg and Halle a. S., the children are received into these schools after medical examination. The teachers keep a careful record of these children from one-half year to the other. The results were so favorable that a large number of the children were returned to the public schools. Others, on the contrary, were transferred to institutions for idiocy.

The Berlin school deputation according to the British Medical Journal (2) has determined that every child of the public schools who is not promoted after two years' stay in one class shall be examined by the school physician in reference to his mental capacity.

In Plauen i. v. the weak-minded children were medically inspected in 1893 and 1894. As an example of the results of this inspection, thirty weak-minded children examined in 1894 were found to have suffered as follows:

7 from an English disease.
3 from diphtheria.
3 from inflammation of the lungs.
5 from acute constitutional diseases.
5 from convulsions.
2 from nervous disorders.

In Austria also especial care is being taken of mentally weak children.

SWITZERLAND.

In Switzerland (3) each canton makes its own arrangements for medical inspection. In Basel the physician devotes most of his time to visiting the schools. He is to test the pupils' eyesight and hearing and to make suggestions as to their proper seating. He examines the conditions of school houses and surroundings and reports to the proper officials. He has power to exclude children on account of illness and sees that parents observe the regulations in regard to infectious diseases.

Teachers recommend to him pupils who they think ought to be placed in special classes for backward pupils, to receive free food, or to be sent on a vacation. He investigates these cases and does not always decide as the teacher recommends. For instance, one year, of 19 boys and 25 girls recommended by the teachers for the dullards' classes, he chose only 16 boys and 23 girls. He is consulted in all new arrangements that the health of the children may be cared for.

(1) Zeit. f. Schul., 1897, page 44.
(2) Zeit. f. Schul., 1897, pp. 231, 280.
(3) Zeit. f. Schul., 1892, page 273.

The general interest in the question is further shown by the fact that the Medical Society of the Canton of Zürich recently recommended that the new school law for the canton should contain the following paragraph: "Periodical investigations should be made by physicians of the health condition of the school children and the sanitary condition of the schools."

The society recommends:

First—That all the children on entering school should be examined in the course of the first school year.

Second—That the investigation should cover the following points: Height, weight, vision, hearing, mouth, teeth, nose, breathing and disturbances of speech, vaccination, general health conditions, physical and mental.

Third—The investigations should take place periodically, and should be at least at the beginning, in the middle, and at the close of the all-day schools, and extended to the secondary schools whenever possible.

Fourth—The physicians should examine the sanitary conditions of the school houses several times a year.

Fifth—Every child should have a health card attached to his diploma.

Sixth, Seventh and Eighth—Details in reference to reports.

Ninth—That the assignment of these investigations to the physicians is within the province of the school authorities.

Tenth—That the physicians should be paid for their work by the state.

GERMANY.

The plan of carrying on the work in the different cities of Germany varies. That of Wiesbaden has been recommended by the Cultus-minister for general adoption and is therefore given somewhat in detail.

From a circular (1) issued May 30, 1897, we learn that the duty of the school physicians is to have oversight of the health condition of the pupils allotted to them, and to co-operate in the medical inspection of the premises and equipment of the school in accordance with the regulations of the authorities in regard to this duty. In accordance with the special regulations it is his duty to investigate the physical condition and health of the pupils who newly enter the school, to determine whether they need permanent medical supervision, or special consultation in the school. (For example, dismissal from instruction in certain subjects, as gymnastics, singing, or limitations of their share of instruction, allotment of special seat on account of defects of eyesight or hearing). A health card is to be filled out for every child, and this is to be kept with him during his whole school period. If a child is in constant need of medical supervision his card is to be marked "medical control," and he is to be reported at each visit of the physician. The weighing and measuring is to be undertaken by the class teacher and record is to be made each half-year on the cards. In cases of lung diseases the chest measurements are to be made by the physician. He is to hold consultation in each school in the forenoon from 10 to 12 every fourteen days, or oftener in

(1) Burnham, Ped. Sem., Vol. VII, No. 1, April, 1900, page 75.

cases of contagious diseases, on a day previously appointed in consultation with the school director. If he wishes to visit the school on some other day than the one decided upon he must notify the director of his intention at least three days before.

The first hour of the consultation period should be devoted to visiting five class rooms during the instruction. Every class room, when possible, should be visited twice each half-year. At these visits all the children are to be subjected to an external inspection; and if, in special cases demanding immediate consideration, information is desired by the teacher, this information is to be given him. If individual pupils appear to need a more careful investigation, this is to be given afterwards in the physician's consultation room. At the same time these visits will serve for inspection of the school localities and their arrangements, and for the control of the ventilation, heating, physical position of the pupils, etc. The second hour of the consultation is to be devoted to any more careful investigation demanded. At this time in pressing cases, the children also from rooms not visited that day are to be presented to the physician, especially where there is suspicion of contagious disease. The class teacher is to be present at the time of the medical inspection. The whole general arrangement is under the school director. The school physician does not treat the cases needing attention. Such children are rather to be directed to their home physician, or to a physician for the poor, or to a special physician, or to some hospital. This may be done orally, but if the warning is not heeded, appropriate printed instructions may be filled out for them. All harsh expressions or the like are to be avoided.

At the request of the school director, the school physician shall investigate individual cases in their homes, to determine, in case the parents bring in other satisfactory certificates, whether absence from school is excusable.

The school physicians shall not have the right to give independent instructions to the school directors and teachers, to the janitors and other school servants. If they believe that the recommendations made by them in respect to the treatment of the children, or the hygiene of the premises, is not given sufficient consideration, then they shall present their complaints with reference to this through their representative in the school hygiene commission. In pressing cases they can also make statements before the city school inspector, or before the Royal Kreisphysikus.

It devolves upon the school physicians to give short lectures on the most important questions of school hygiene before the teachers' meeting.

Before May the 15th of each year the school physicians shall make a written report to the senior school physician, who in turn reports to the magistrate by the 1st of June. The following points are to be covered in the reports:

(1) Statistical tables of the results of the initial examinations.

(2) The number of consultation hours held, and the official visits to the class rooms.

(3) The number and kind of the more important cases of diseases which have been investigated in the consultation hours.

(4) Any special dispensations made (limitations of the hours of instruction of gymnastics excepted).

(5) The number of written communications sent to parents.

(6) The number of school children under special medical supervision or control.

(7) A summary of the notes in regard to the premises that have been entered in the hygiene book.

According to the last report (1) of the medical examination of Wiesbaden an examination of 1,300 children was made and only fifteen were exempted from this by the presentation of a certificate from a home physician. The result of this examination showed in the middle schools as regards general health, 44.9 per cent. good, 54.8 per cent. medium, 3 per cent. bad. In the people's schools, on the other hand, 34.4 per cent. good, 58.8 per cent. medium, 6.8 per cent. bad.

Among about 300 children in the middle schools less than 11 per cent. were found suffering from diseases, not reckoning defects of the teeth; and among about 970 children in the people's schools 51 per cent. In eight cases contagious diseases were detected, and the children immediately excluded from the school, three cases of scarlatina, one of measles, and four of whooping cough. Drastic measures were adopted in regard to pediculosis; compulsory cleaning at the city hospital in three cases, had a good effect; the number of cases of children suffering from parasites decreased from 194 in the previous year to 125. In the course of the school year in some one hundred cases written communications had been sent to the parents in regard to the diseases of their children, and in sixty-five cases, as a direct result, pupils had been supplied with spectacles, had received medical treatment, etc. In some eighty cases, special care in instruction, gymnastics, etc., had been arranged for at the advice of the physician. Further, thirty-six teachers from different schools had received a short course of instruction in regard to emergencies, etc.; and in common sittings of the school physicians with the hygiene commission a number of questions relating to questions of hygiene had been discussed. (2)

The report of the school physicians in Darmstadt for the year 1898-1899 gives the following statistics: "Among 5,502 children tested, the general health in 26.3 per cent. of the cases is reported as good; in 68.67 per cent. of the cases it is reported as fair, and only in 280 cases is the report bad, viz., in 5.08 per cent. of all; 2,308 cases of disease were observed, most frequently anaemia, about 10.5 per cent. of the girls and 2.5 per cent. of the boys; then scrofula, rickets, diseases of the bones, diseases of the mouth, nose and throat. About 80 per cent. of the children tested had bad teeth; parasites were found in about 200 cases. These children were placed under constant supervision and in 5.3 per cent. of the cases special care was required during instruction." (3)

(1) Burnham, Ped. Sem., Vol. VII, page 80, from Zeit. f. Schul. No. 11, pp. 637-650 and No. 12, pp. 728-733.
(2) Ped. Sem., Vol. VII, page 80.
(3) Ibid, p. 80.

LONDON.

Dr. Crichton Browne (1) investigated eleven elementary schools in London as to the health of the pupils. Of 6,580 pupils interrogated as to habitual headaches, 3,034, or 46.10 per cent., were reported as thus afflicted. The report shows 43 per cent. of the first standard, 46.5 of the second, 44.2 of the third, 46.8 of the fourth, 48.2 of the fifth, and 56.3 of the sixth, afflicted with habitual headaches. He contends that a majority of headaches are of a distinctly nervous character and proceed from functional disorder or organic change in some portion of the nervous system. He gives extended tables showing the localization of headaches, his effort being to prove that over-pressure exists in the English schools.

He examined 4,300 pupils as to sleeplessness and reports 1,668, or 38.8 per cent. as thus afflicted. Among 527 pupil teachers, 340, or 64.5 per cent., were reported as habitually having headaches. Among 107 students in a training college, 60, or 56 per cent., had habitual headaches. Among 388 pupil teachers, 211, or 54.4 per cent., suffered with neuralgia within a period of six months.

For the purpose of comparison, Dr. Browne examined 355 children, 186 boys and 149 girls, of ages from 6 to 14, of five Scotch schools, situated in the agricultural district of Dumfriesshire, and found that only 23 complained of headaches, which gives a percentage of 6.5, against 46.1 for London.

Dr. Browne thinks that he was reasonably careful in his investigations and that the real number of headaches is even greater than the number reported.

Mr. J. G. Fitch, one of Her Majesty's chief inspectors of schools, says: "But the method of investigation adopted by Dr. Browne appeared, so far as I am able to form an opinion, to be neither judicious nor trustworthy. He stands before a class, say of sixty boys, and asks all who ever have headaches to hold up their hands. He proceeds to ask all who feel it at the back of their heads, at the top, in the forehead; all those who suffer from it in the morning, in the afternoon, in the evening, successively to hold up their hands. The boys are amused, and a little puzzled; they peep at one another; they look at the teacher to try to catch some indication of the way in which they are expected to act; they see the strange gentleman counting their hands and gravely recording the result in a note-book; and their hands go up or are kept down very much at random. After seeing this process repeated a great many times, I wish, with all deference, to express my conviction that it is an utterly unscientific mode of arriving at evidence, and that the results bear no true relation to the children's actual experience or knowledge." (2)

(1) Dr. Crichton Browne, "Report on Eng. Elem. Schools." Printed by order of House of Commons, 1884.
(2) Memorandum on Dr. Browne's report by Mr. J. G. Fitch, page 56.

DENMARK AND SWEDEN.

The first fundamental research into the physical and mental health of school children was instituted in Copenhagen by Dr. Hertel in 1881. The result of Dr. Hertel's work was so significant that a special commission was appointed to examine the conditions of health in all the schools in the kingdom. About the same time a grand commission was named in Sweden to examine into the conditions of school life.

The Danish Commission (1), (reported in 1883,) examined 17,595 boys and 11,646 girls in the higher schools and in the Volksschulen, ranging in age from 6 years to 19 years. The diseases reported were chronic, no record being made of the acute diseases. These were scrofula, anaemia, nervous complaints, headache, nose-bleed, chronic indigestion, chronic lung and heart complaints, curvature of the spine, rheumatism, etc. This commission found from 26 to 34 per cent. of all the boys ill with some disease or other, varying with the age, being highest at the ages of 10 and 18 years. The girls, from the ages of 7 to 18 years, showed an illness of from 25 to 50 per cent., being the greatest between the ages of 13 and 14 years. The Swedish commission examined about 15,000 boys and 3,000 girls, and found that among the boys varying at different ages, 28 to 40 per cent. were sick with chronic disorders. The girls between the ages of 7 and 18 years showed an illness of 25 to 64 per cent., being highest in the 13th year.

A member of the Swedish commission, Prof. Axel Key, speaks as follows (2):

"According to my examinations of 15,000 boys in the middle schools, more than one-third are ill or are afflicted with chronic maladies. Shortsightedness, which is demonstrably for the most part induced by overtaxing the eyes in school work, and well merits the name of schoool sickness, rises rapidly in height of prevalence from class to class. Thirteen and a half per cent. of the boys suffer from habitual headache, and nearly 13 per cent are pallid; and other diseases arise in the lower classes to decline and rise again in the upper classes. Diseases of the lungs are most frequent among organic disorders. Diseases of the heart and intestinal disorders show a considerable tendency to increase in the higher classes. As to the average of illness in the different classes, it appears that in Stockholm 17 per cent. of the children in the first class were ill at the end of the first year. In the second school year the illness curve rose to 37 per cent., and in the fourth class to 40 per cent. This remarkable increase of illness during the first school year is not casual, but it is exhibited in all the schools; and corresponding conditions were brought to light in the examinations of Danish pupils. A sickness ratio of 34.4 per cent. was found as early as in the lowest classes of the middle schools.

"The most healthy of all the years of youth is with boys of the 17th, which is also one of the two years of most active growth. The 18th, on

(1) Burk, "Growth of Children." Am. Jour. of Psych., Vol. 9, No. 3, April, 1898, page 288.

(2) "School Life in Relation to Growth and Health," Popular Science Mo., Vol. 38, pp. 107 ff. 1890-91.

the contrary, which follows immediately on the attainment of puberty, appears to be a very unhealthy period.

"Among the school girls, the future mothers of generations to come, investigation instituted in thirty-five schools, with 3,072 pupils, brought out a fearful amount of illness. Sixty-one per cent. of the whole, all belonging to the well-to-do classes, were ill or afflicted with serious chronic disorders. Thirty-six per cent. were suffering from chlorosis, and as many from habitual headache; at least 10 per cent. had had spinal disorders, etc."

PARIS. (1)

As regards the history of medical supervision of schools in Paris, it should be observed that the law of 1833 made it the duty of the school committees of the respective towns and cities of France to keep the school houses clean as a sanitary precaution, and a royal ordinance of 1837 especially charged the supervisors of the maternal schools (kindergartens) to watch over the health of the little ones. These two decrees referred to all the schools of France. Special decrees for Paris were issued in 1842 and 1843, ordering all the public schools to be visited by a physician, whose duty was to inspect the buildings and grounds, as well as the general health of the children. No appropriation, however, was made for this purpose, and the generosity of the medical fraternity had to be called upon to carry out this very commendable arrangement, and a number offered their services and acted gratuitously for many years.

In 1878 the system was reorganized, and 34,200 francs were voted by the council for paying the medical supervisors of the schools. The Seine department was divided into 114 districts for medical supervision, each containing some twenty or twenty-five school rooms. Of these districts 88 were within the city limits of Paris. The medical inspectors were selected only from graduates of well reputed schools of medicine, were to be nominated by the mayors of the respective wards (arrondissements), and appointed by the prefect of the department. Their annual salary was fixed at 600 francs, and the term of office three years. Their duty was to visit each school of their respective districts at least once in two weeks, and to inspect the "localities" (corridors, stairs, water-closets, etc.), of the schools, and remove children having any contagion. They might order the schools closed in times of epidemics. During the absence of the physician the principals, who had received instructions in regard to the symptoms of contagious diseases, watched over the health of the children.

Profiting by the experience of the first three years of this service, the city council appointed a commission to revise the regulations, which revision was reported and adopted in November, 1883, and went into effect January 1, 1884.

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(1) "Medical Supervision of the Schools in Paris," Report of Commissioner of Education, 1897-98, page 1509, from Educational News, December, 1890.

These new regulations, which are still in force, contained the following changes or additions:

Each district for medical supervision is to contain from fifteen to twenty school rooms. The city is to be redistricted every three years by the prefect. The annual salary of a school physician is 800 francs. Every school physician must announce to the mayor his residence or office and the hours at which he may be found there.

This statement is posted in a conspicuous place in every school room. In addition to his semi-monthly visit to each school room he must also appear whenever the mayor or prefect may deem it wise to require a visit. He must examine each child at least once a month with reference to eyes, ears and teeth. If he notices any indication of disease, or if the general health of the child needs attention, this is noted on a certificate and sent to the parents of the child. If a child appears to be sick during the absence of the physician the teacher reports the case to the principal, who has at hand instructions from the supreme sanitary council, in which the symptoms of contagious and infectious diseases are stated. If he finds symptoms of any contagious or infectious disease, he sends the child home with a note, asking the parents to call at the office of the school physician during his office hours. A certificate of recovery, signed by a school physician, is required of every child who has been out of school on account of sickness.

Within twenty-four hours after each sanitary and medical inspection the physician is obliged to report to the mayor of the ward the sanitary condition of the school. The mayor is required to report to the prefect summaries of the various individual reports and propositions and suggestions which seem of special importance. Propositions not so pressing and of general importance are referred to special medical committees for deliberation and subsequent report.

The mayor reports every three months to the prefect of the department the sanitary and medical condition of his ward. Semi-annually he sends in a report containing suggestions for changes and improvements. In 1887 medical and sanitary inspection was made obligatory "for all schools, public and private" (1). The system of medical supervision of schools of Paris has become a model for other cities of France.

Dr. Herman T. Lukens (2) says (1899): "Dr. Mangenot has drafted a project of a new law requiring daily visits and individual examination with separate individual bulletins for each pupil. All the pupils are to be weighed and measured twice a year. These data are to furnish the basis for indicating to teachers, first, how to seat the pupils; second, which to relieve of home work or gymnastics; third, which need medical attention outside; fourth, which need preventive medication (i. e., supplement to home

(1) Mangenot, writing in 1896, says that the private schools in both Paris and the provinces have no medical inspection. (Ped. Sem., Vol. VII, page 72.)

(2) "Notes Abroad," page 9.

diet, e. g., cod liver oil, etc.); fifth, which pupils should join the 'colonies scolaires.' "

CHILDREN'S DISPENSARIES. (1)

As early as 1862 there were a few dispensaries in Paris where children of certain hospitals could receive treatment. These were supported by charitable societies, and could not always furnish all the treatment that was most desirable. In 1875 a public free dispensary for children was established in Havre by Dr. Giebert, assisted by private contributions. This has the distinction of being the first of its kind ever established. It had a remarkable success from the start, and soon was made a city institution.

The first children's dispensary in Paris was opened in 1883, in the first ward. In the first seven years of its existence there were conducted 60,000 consultations. The number the first year was 5,037. This was steadily increased to 19,000 in 1889. "The example set by the first arrondissement soon found imitators. To-day (1890) eight arrondissements have children's dispensaries, partly supported by private persons, partly by the city. The excellent influence these few institutions have exerted has awakened the desire of increasing their number and to provide every ward of the city with one; hence a credit of 100,000 francs was opened for that purpose in the city budget of 1890, and all indications point toward an early fulfillment of the desire mentioned above, namely, that the medical and sanitary inspection of the schools be supplemented by a great number of free dispensaries, in which children will find treatment needed in cases of sickness."

BOSTON. (2)

In 1890 the board of health of the city of Boston proposed to furnish daily medical inspection, with the view of discovering the earliest symptoms of infectious diseases among the children. On account of the lack of an appropriation of funds for that purpose the system was not inaugurated until November of 1894. The board of health divided the city into districts, giving about 1,400 pupils, and an average of four school houses to each district. One inspector, at a salary of $200 a year, was appointed for each district. Some of the best medical talent in the city are engaged in the work. Their duty is to visit each school daily, early in the morning, and to examine all children whom the teacher thinks ailing. The teachers report to the principal all pupils whom they think appear ill, the physician examines them, and if any one is found too ill to remain in school, from any cause, he is sent home for the observation and care of his parents and family physician. If the illness is contagious the child is ordered home and the case is reported to the board of health. It is also the duty of the inspector to visit the homes where contagious diseases exist, to see that

(1) United States Education Report, 1897-98, page 1511.
(2) Mass. State Board of Health Report, 1894, p. 819; 1895, p. 756; 1896, p. 870.

proper isolation of the patient is attended to. The child is not readmitted to school without permission of the inspector.

Superintendent Seaver, in his annual report for 1895, gives the following (1):

"The total number of children examined during the four months ending February 28, 1895, was 9,063, of whom 5,825 were found to be sick, and 3,238 were found to be not sick. The number found sick enough to be sent home was 1,033; of these 280 were suffering from contagious diseases, as follows: Dipththeria, 58; scarlet fever, 19; measles, 42; whooping cough, 17; mumps, 35; pediculosis, 47; scabies, 33; congenital syphilis, 7; chicken-pox, 22. These children were in their seats spreading contagious diseases amongst other children. The number of children who were saved from these diseases by the timely discovery and isolation of the sick children is, of course, beyond computation.

The other diseases discovered and for which necessity for treatment was pointed out were as follows: Abscess, 22; catarrh, 244; cellulitis, 12; chorea, 11; colds, with more or less bronchitis, 224; debility, 63; diseases of the ear, 35; diseases of the skin and scalp, 186; diseases of the throat and mouth, 3,489; epilepsy, 5; fracture of the collar bone, 1; headache, 171; indigestion, 42; malaria, 17; nausea, 50; Potts' disease, 3; swollen glands, 133; ulcers, 16; wounds, 21; miscellaneous diseases, 411; examined for vaccination, 117."

For the fourteen months from November 1, 1894, to December 31, 1895, 16,790 pupils were examined; 6,053 were not sick, 10,737 were found to be ill, and of these 2,041 were sick enough to be sent home. (2)

The following contagious diseases were found:

Diphtheria	77
Scarlet fever	28
Measles	116
Chicken pox	28
Mumps	47
Whooping cough	33
Pediculosis	69
Scabies	47
Congenital syphilis	8
Total	453

For the year 1896, twelve months, 8,964 pupils were examined; 1,156 were too ill to remain in school.

(1) Annual Report of Public Schools, Boston, page 77.
(2) H. D. Arnold, M. D., "Med. Insp. of Schools." Annals of Gynecology and Pediatry, January, 1898, Vol. XI. Report of Com. of Education, 1897-8, page 1491.

Specific infectious diseases:

Diphtheria	26
Scarlet fever	8
Measles	59
Chicken pox	35
Mumps	54
Whooping cough.	71
Syphilitic	5
Tuberculosis	3
Influenza	4
Erysipelas	1
Malaria	1
Total	267
Oral and respiratory diseases	3,934
Ear diseases	66
Eye diseases	382
Skin diseases	628
Miscellaneous diseases	3,687
Total	8,964

Dr. Durgin reports an epidemic of diphtheria as follows (1): "An epidemic of dipththeria occurred in a primary school in which there were forty pupils, fourteen of whom were attacked with diphtheria within a period of eighteen days, all from one room. Of the fourteen cases seven were discovered by the school inspector and three of these only by cultures. All suspicious cases were dismissed from school May 5, and recommended to the care of their family physicians. The next morning every pupil was examined and many cultures were taken. The class was then dismissed from Thursday to the following Monday, the room disinfected and cleaned. For ten days after their return the throat of every pupil was examined by the medical inspector when they first assembled in the morning, and no pupil who had been absent with any suspicious symptoms was allowed to return until it was proved by a negative culture that there could be no danger. As a result of these measures not a single case of diphtheria resulted beyond those known to have been infected at the time the epidemic was discovered. A similar experience with scarlet fever occurred in the service of the same school inspector within two weeks, in which eleven cases resulted from the presence in school of one pupil whose illness had been attributed to German measles."

Superintendent Edwin P. Seaver, under date of October 30, 1899, in a letter to the writer, states: "The system has been in operation for several years and has been found universally acceptable. There is no doubt

(1) "Medical Inspection of Schools," S. H. Durgin, M. D., Ch. Board of Health, Boston. Read at Annual Meeting of the Mass. Med. Society, June 9, 1897, page 7.

that it has protected the school from the ravages of epidemics and other diseases, such as scarlet fever, diphtheria, and recently, I may add, small-pox."

NEW YORK. (1)

In 1897 New York City instituted medical supervision by appointing 134 physicians to visit the schools. Later the number has been increased to 150. "Inspectors are requested to report at the schools to which they have been assigned from 8:50 to 9:30 a. m. every day that school sessions are held. They are carefully to examine each child that has been isolated by the teachers in charge of the schools, and cause to be excluded from school each one affected with or showing symptoms of any contagious or infectious disease, more especially the following: Measles, diphtheria, scarlet fever, croup, whooping cough, mumps, contagious eye diseases, parasitic diseases of the head or body, or chicken pox." (2)

The child excluded from school is furnished a card by the inspector stating the reason for the expulsion. Within twenty-four hours of the time the child is excluded from school one of the diagnosticians of the board is sent to the home of the child for further examination. If he confirms the first diagnosis the pupil is excluded until complete recovery is effected, when a certificate allowing him to return to school is issued.

The first day, March 29, 1897, gave the following results: (3)

140 children excluded.
14 cases diphtheria.
3 cases measles.
1 case scarlet fever.
35 cases contagious eye diseases.
3 cases mumps.
1 case croup.
8 cases chicken pox.
8 cases skin diseases.
67 cases parasitic diseases.

Cases of neglect of cleanliness were numerous.

The weekly report (4) of the chief inspector, Dr. Blauvelt, for the week ending April 10, 1897, shows that 7,398 children were examined and 364 excluded from school.

The number of diseases was as follows:

2 measles.
13 diphtheria.
1 scarlet fever.
3 croup.
4 whooping cough.
10 mumps.

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(1) Boston Medical and Surgical Journal, March, 1897.
(2) Instructions for Med. Sch. Inspectors, New York, 1899, page 1.
(3) "Physical Training in New England Schools," W. Scott, Boston, page 4.
(4) New York Medical Record, April 22, 1897.

59 contagious eye diseases.
227 parasitic diseases.
15 chicken pox.
19 skin diseases.

Dr. Blauvelt's report (1) to the board of health for the week ending April 23, 1897, showed 4,599 examinations, of which number 243 were excluded, having the following diseases:

4 cases of measles.
4 cases of diphtheria.
1 case of scarlet fever.
2 cases of croup.
13 cases of mumps.
8 cases of chicken pox.
28 cases of contagious diseases.
160 cases of parasitic diseases of the head and body.
13 skin diseases.

CHICAGO. (2)

The board of health of Chicago, in 1895, instituted a system of inspection of schools, but from a lack of funds appropriated for the special purpose it was very inefficient. The city was divided into nine districts, one medical inspector being assigned to each, giving an average of more than twenty square miles for each inspector to cover. Notwithstanding this limited service, during four months 350 individual inspections of 233 public schools were made, with the result that 1,417 cases of diphtheria and 306 cases of scarlet fever were located. During the school year 1896-97, 1,181 visits were made and 4,023 cases of contagious diseases were located and taken charge of for preventing further spread of the same. The unsanitary conditions of sixty-three public schools were reported to the board of education, and unsanitary conditions remedied in fifty-three homes of patients.

On November 15, 1899 (3), the board of education decided to appoint fifty medical inspectors, at a salary of $50 a month, to serve through the school year while school was actually in session. These inspectors are attached to the department of compulsory education, and are assigned to duty under the direction of the commissioner of health.

The present plan was proposed by Dr. Christopher, a member of the board, and is somewhat modeled after the plan adopted in Boston and New York. An examination of applicants for the position of inspector is made, and those are selected who show the greatest fitness for the work by their knowledge of children's diseases. The city is divided into fifty districts, having an average of between 4,000 and 5,000 pupils in each. It is the

(1) New York Medical Record, May 1, 1897.
(2) Miss Dora Keen, "Medical Inspection of Schools," Report of Com. of Ed. 1897-98, page 1502.
(3) Report of Board of Education, Chicago, Nov. 1 and 15, 1899, pp. 153 and 160 ff.

duty of the inspector to visit the schools daily in the morning and examine all pupils returning to their classes after an absence of four days or more, and all who exhibit any tendency toward fever or soreness of the throat. The pupils needing examination are retained in the office of the principal until the inspector arrives and examines each one separately. In cases of sore throat cultures are taken and sent to the bacteriological laboratory of the health department, and the pupil is sent home with instructions to return the next day, by which time the culture has been examined and the principal notified what disposition to make of the child.

The results of the work from January 8 to May 1, 1900, are as follows:

Seventy-six thousand eight hundred and five examinations were conducted during that period, and 4,539 cases of infectious diseases were excluded from schools; 711 cultures were taken. Out of the total number of 76,805 examinations, only one law suit resulted, and in this the court decided in favor of the board of education. (1)

	Jan.	Feb.	Mar.	Apr.	Total.
Diphtheria	94	41	27	8	170
Scarlet fever	165	104	80	52	401
Measles	199	135	224	90	648
Whooping cough	12	14	17	12	55
Chicken pox	184	217	200	69	670
Tonsilitis	318	164	145	62	689
Mumps	164	361	432	203	1,160
Purulent sore eyes	20	13	15	7	55
Impetigo	65	53	54	21	193
Pediculosis	77	73	68	22	241
Ringworm	27	21	19	9	76
Eczema	13	13	14	8	48
Other diseases	41	33	39	20	133
Total exclusions	1,379	1,242	1,334	584	4,539
Total No. of pupils examined	18,155	23,388	24,914	10,348	76,805
No. of inspectors reporting	49	49	49	49	49
No. of cultures taken	140	240	257	74	711

BROOKLINE, MASS.

December 10, 1894, the board of education voted to employ a sufficient number of physicians to make daily inspections of the schools. Six inspectors and four substitutes were at once appointed. All accepted, were assigned to schools, and on the 11th all were at their posts. Their duty was to examine only such pupils as the teachers thought to be ill, and to give advice as to the disposal of sick children. Superintendent Dutton, in a letter to the writer, under date of October 23, 1899, says:

"Except in cases of contagious diseases, these visits are not made very frequently, but during the past few weeks, when we have had some diphtheria in the town, there have been daily inspections in all our schools.

(1) Report of Board of Education May 16, 1900.

If anything suspicious is discovered the matter is referred to the attendant physician, and in the case of sore throat cultures are taken and submitted to the bacteriological department, which is under the direction of the board of health of the town."

CAMBRIDGE, MASS. (1)

In 1894, at the request of the school committee, the board of health appointed a physician, whose duty it is to examine all cases of contagious diseases reported, and to exclude such pupils as in his opinion will endanger the health of others. He also issues all certificates authorizing such children to return to school. On February 26, 1896, as a further precaution against contagious diseases, the board of health established a system of medical inspection of children in the schools. The city was divided into six districts and a physician appointed for each to inspect the schools daily. They began their work on April 6, 1896. In May an additional inspector was appointed for the parochial school.

It is the duty of the inspector to examine only such children as are indicated to him by the teacher as having complained or as appearing to be suffering from disease, and the principal is to dispose of the pupil as the inspector may recommend.

The physician must not recommend the employment of any special physician or mode of treatment for any particular case. In cases of near-sightedness or other trouble with the eyes, or deafness, or other ear trouble, to which attention has been directed by the teacher, the physician is instructed to suggest that the principal recommend to the parents that the eyes or ears of the pupil be examined.

The report for the year ending December 31, 1896, shows the diseases and number of cases discovered in the schools since the inspection began as given below: (2)

Chicken pox	20
Chorea	1
Diphtheria	7
Erysipelas	1
Measles	11
Mumps	10
Pediculosis	13
Phthisis	1
Scarlet fever	15
Syphilis, congenital	1
Whooping cough	21
Diseases of the ear	4
Diseases of the eye	7
Diseases of the skin	18
All other diseases	41
Total	171

(1) Report of School Comm. Cambridge, 1898, page 42.
(2) Report of Board of Health, Cambridge, 1896, page 7.

ST. LOUIS. (1)

Dr. Hamon, in accordance with the wishes of the hospital alumni of St. Louis, secured the co-operation of the school board of St. Louis in making a trial inspection of twelve schools. With the assistance of others of the society, who gratuitously rendered their services, daily inspection of these twelve schools was made during the months of October, November and December, 1898. The teachers sent the pupils whom they thought to be ailing to the principal's office at a stated time, and the physician appointed for that building examined them in the presence of the principal. These twelve schools had an average daily attendance of 9,586 pupils. Nearly 17 per cent. of these, or 1,601, were found to be ill; 156 were recommended to be sent home.

The diseases reported were classed as follows:

Specific infectious diseases	76
Oral and respiratory tract diseases	787
Ear diseases	37
Eye diseases	382
Skin diseases	45
Miscellaneous diseases	274

PHILADELPHIA. (2)

On June 7, 1898, the bureau of health—

Resolved, That the medical inspector be directed to have the fifteen assistant medical inspectors visit one public school each day in their respective districts, who shall inspect each school according to the methods now employed in Boston, New York and Chicago.

The system thus instituted was not found to be very satisfactory, and a new plan of visitation was arranged and put into operation in January, 1900. The board of education selected 300 physicians from a larger number recommended by the deans of the medical colleges, the authorities of the hospitals and citizens, and assigned them to the various schools. It is their duty to make visits to the schools of their respective districts between 9:30 and 10 each morning, and inspect such children as the principals shall bring to them. A child having or threatened with any disease that is contagious or infectious is sent home with instructions to the family to consult a physician, and it will not be received back into the school without a certificate stating that it is safe to do so, signed by a medical inspector of the bureau of health. If a child requires medical treatment for other complaints a notice is sent to the family with such advice. The work for the present is being done without remuneration, but it is hoped by the authorities that when the time comes for appropriations fair compensation will be paid for the service.

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(1) Dr. Hinchey. "Medical Inspection of Schools," Med. Fortnightly, 1899, page 360.

(2) Medical Record, January 13, 1900.

The Medical Fortnightly of April 10, 1900, is authority for the statement that good results are being accomplished, and that "medical men have fairly tumbled over each other and over themselves to secure appointments as inspectors."

MILWAUKEE. (1)

In January, 1900, the city being threatened with an epidemic of diphtheria, scarlet fever and measles, the board of school directors invited the health commissioner to advise with them as to the best methods to check the spread of these diseases. After full discussion the matter was placed in the hands of the health department, as the city charter contains a provision empowering the commissioner to take such measures as he may deem advisable in emergencies of this nature. He thereupon added seven physicians to his staff, making in all twelve. These doctors were assigned to certain districts and instructed to visit the public schools daily. Much good was thereby accomplished by lessening the number of cases of infectious diseases, and thereby preventing an epidemic.

The results of these examinations of school children for three months, beginning with January 23, are shown in the following table:

Total number of school days	61
Total number of pupils examined	22,525
Total number of males	10,666
Total number of females	11,859
Average number examined daily	369
Number found sick with diphtheria	4
Number found sick with measles	275
Number found sick with scarlet fever	67
Number found sick with whooping cough	16
Number found sick with other ailments	3,676
Average daily found sick from all causes	66

The report urges the importance of having a competent physician officially appointed by the board of education as medical inspector, whose duty should be to devote his entire time to the work.

OTHER CITIES.

In Paterson, N. J., medical inspection was instituted November 30, 1900. The medical inspectors are appointed by the board of education and must report to the board each month. They are under the control of the board of health, and must report to them each week as to the number of cases inspected, the nature of diseases, etc. They are appointed yearly and receive an annual salary of $250. They must report to each school at 10 a. m.

A volunteer system of daily medical inspection was instituted in the schools of Minneapolis in 1901. Medical inspection is confined to acute cases. The inspector advises the return home of non-contagious cases at his discretion, orders the dismissal of contagious cases or of infected families, examines children in rooms infected or in danger of infection, etc. The system is reported as being satisfactorily successful as a beginning.

(1) Report of School Directors, April 30, 1900, pp. 353-355.

In January, 1902, by permission of the board of education of Detroit, a system of medical inspection was instituted under the direction and control of the board of health. A physician is assigned, without remuneration, to each school. The physician reports at the opening of school each morning and examines all pupils who have been absent, or those whom the teachers present for examination.

The board of education of Lincoln, Neb., in December, 1901, arranged a system whereby the public schools of the city should receive competent voluntary medical inspection. The inspectors serve without pay and make daily visits to the schools between the hours of 9:30 and 11 a. m. The board of education divides the city into two districts and appoints a chief inspector for each district. The chairman of the board of health and the two chief inspectors constitute a board of medical inspection. The board of education appoints the inspectors. Thus the system is kept under the control of the school board.

Newark, N. J., has twelve medical inspectors, who make daily visits to the schools between the hours of 9 and 11 a. m. each school day. They make daily reports to the board of health, and on the last school day of each week they are required to fill out a weekly report for each school and send the same to the board of health. Duplicate reports are also sent at the same time to the board of education. "Inspectors shall not under any circumstances prescribe or suggest treatment or in any manner interfere with the attendance of the family physician."

The beneficial effect of medical inspection in lessening the number of cases of scarlet fever and diphtheria in Chicago is shown in the following table, compiled from the reports of the Chicago health department for the year preceding medical inspection and the first year under such inspection: (1)

	1899.				1900.			
	Diphtheria.		Scarlet Fever.		Diphtheria.		Scarlet Fever.	
	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
January ...	381	82	306	26	572	111	805	48
February ..	307	62	377	41	362	88	505	47
March	284	55	522	68	315	82	435	21
April	240	56	507	71	229	67	303	19
May	266	55	512	68	230	58	338	26
June	248	63	370	43	211	58	207	18
July	174	47	269	20	158	41	142	10
August	235	60	256	28	103	33	92	2
September..	241	75	327	31	187	42	107	4
October ...	489	93	747	35	306	79	160	13
November..	608	92	888	53	317	72	170	6
December .	458	103	719	49	313	66	211	12
Total.....	3,931	843	5,800	533	3,303	797	3,475	226

(1) "School Medical Inspection in Chicago," by W. D. Byrne, M. D. Reprint from The Journal of the American Medical Association, Nov. 23, 1901.

Says Dr. Byrne: "It is thus seen that a decrease in the number of diphtheria cases was 628 for the year, with 46 fewer deaths. In scarlet fever the decrease in cases was 2,325, with 307 fewer deaths.

"These figures make even a better showing when it is considered that physicians, as a rule, were more careful in 1900 to report cases of this nature to the health department than in previous years, and the rapid growth of Chicago must also be taken into consideration. These facts add much to the excellent results shown in the foregoing table."

TUBERCULOSIS IN TEACHERS.

In treating this subject the health of the teacher should not be ignored. A teacher physically unable for the work ought not to be in the school room. One afflicted with any form of tuberculosis should not be allowed to be housed in the same room, day after day, with children. It is an admitted fact that tuberculosis is infectious. If this rapidly increasing disease is to be stamped out, or even checked, we must prevent its spread. No teacher ought to be employed who might in any way endanger the health of those committed to her care.

EXPENSE.

The matter of expense is an important item in the consideration of any innovation. In Boston the medical inspector's salary is $200 (1) a year, and the average number of pupils in each district is about 1,400. In New York each inspector is paid $300 a year with a larger number of pupils to examine than in Boston. The chief inspector receives $2,500 a year. In Chicago (2) the salary of inspector is not to exceed $50 a month with an average of some 4,000 to 5,000 pupils in his district. The amount of salary should be regulated according to the amount of time the inspector is required to spend in performing his work. It can necessarily only occupy a part of the physician's time, and as it comes regularly at stated times, it need not demand the same amount of remuneration as the rest of his professional work. Often young, though competent, members of the profession would be glad of the opportunity at a comparatively small salary. The plan ought to work as well in small cities and towns as it does in large ones. The benefit would be as great in proportion to the number of inhabitants and the services of members of the medical profession would be as easily secured.

OBJECTIONS.

Thus far in this country there have been but few if any objections urged against medical inspection. In Germany some physicians have objected on the score of favoritism and that creating a special class of school physicians interferes with the business of the regular practitioners. Many teachers in

(1) Durgin, Paper read at annual meeting of Mass. Med. Society, June 9, '97.
(2) Report of Board of Education, 1899, page 162.

Germany seem to think that it interferes with the regular work of the school. Objection has also been made by some on the grounds of unwarranted interference with individual liberty. In 1899 the Teachers' Association of Hanover-Linden (1) adopted resolutions recommending a modified system in which the medical inspection should be accomplished without its being in connection with the school except when recommended by the teachers. This is practically what is accomplished in Boston and other American cities; for the children are here referred by the teacher to the school physician by being sent to a room specially provided for the purpose.

Most of these objections are of such a trivial character that they seem to need no answer. To those urged by the teacher it is well to observe that the fault seems to lie in the plan rather than in the idea itself. Medical inspection is a comparatively new thing and doubtless the plans that have been pursued so far are perhaps not the best that may be devised. All agree that sanitary supervision is necessary. I see no good reason for the school physician to be required to spend part of his time in the school room while the recitations are being conducted as is required in Wiesbaden. Experience will doubtless soon suggest a universally acceptable plan for carrying on the work.

CONCLUSIONS.

The system of medical inspection of schools should be under the control of the Board of Education. It should be a department of the school system, and only related to the Board of Health as the two bodies may be of mutual benefit in performing their respective functions. It would be less liable to interfere with any other department of the school system, and be free from the vicissitudes frequently incident to the Board of Health from political changes. It would be more liable to become a factor of the school system, assisting the teacher in determining the physical condition of all defective children, thereby enlarging its sphere of usefulness.

The question of taking care of the pupils who are reported as sick till the inspector comes, is an important one. To place the sick pupils together in one room and thereby expose each to the contagion of the other, seems objectionable. It seems best to send the pupil having symptoms of contagion to his home, and for the inspector to make the examination there.

By daily medical inspection of the pupils diseases are detected in their incipiency and therefore most easily dealt with, and, in cases of infectious diseases, they can be isolated. The treatment of diphtheria with anti-toxin, it is well known, should be as early as possible to insure success. In November and December of 1898, in the city of Chicago, there were 219 cases of diphtheria treated with anti-toxin. Of these nine cases died, but there were no deaths among those treated on the first or second day. Medical inspection of school children is the best means of preventing disease. It should be the aim of the medical profession to prevent sickness as well as to cure

(1) Ped. Sem., Vol. VII., April, 1900, page 86.

the sick, and by doing this the profession is attaining its highest ideal. Medical inspection is truly prophylactic work, and when it is once well established our physicians will be able to broaden their field of usefulness by the more careful study of the growing body in relation to exercise and education. The field is a practical one and is worthy the ambition of the best talent of our race. What has been accomplished in science in recent years bids us hope that the questions which perplex us now ere long may become as clear as day, and we shall go on in the pursuit of higher and nobler ideals.

It would be asking too much of the teacher to be able to diagnose the cases of disease which appear before her. This requires medical skill and can only be properly done by regular physicians.

It should be the duty of the school physician to assist the teacher in determining how much work each pupil should undertake. In periods of rapid growth, care must be had not to unduly irritate or depress by inappropriate tasks the nerve centers so as to produce various forms of neurotic diseases. The protection of the growing brain from misdirected work is a difficult task and an appropriate undertaking for medical skill. The comparatively recent researches in biology throw much light on the order of brain growth and render it plausible that further investigations may enable the skillful physician to determine more definitely this important point.

The prevention of disease and physical disorder is a public blessing, particularly the prevention of the spread of contagious diseases. It requires time, energy and skill on the part of some one to accomplish this end. The public purse ought to pay for that which is a public benefit.

Medical inspection would be a valuable benefit to a community in directing the people to sanitary measures which they would practice in their homes by reason of having their attention directed to them. It would be educative by spreading among the people more generally a knowledge of the common laws of health.

Disease not checked or prevented in children is what makes dependents in adults. Our country is burdened with the insane, the feeble-minded, the deaf and dumb, the blind, the epileptic, orphans and paupers. Ohio is a fair representative of the states. There were spent in Ohio in 1894 for charities $4,175,915.47. The income of all the colleges of the state for 1896-97 amounted to about $1,000,000. Over four times as much was spent on charities as for higher education. Education is nothing without health and a physical constitution. It is high time that we strike a blow at the root of all this defectiveness. One does not wonder at the condition of adults when he reflects on the percentage of defectives among children. Strong, robust, healthful childhood would prevent much of this inability in adult life. The cost of medical inspection is but a bagatelle compared to the good it would accomplish in mitigating suffering and making those self-supporting who otherwise would probably be objects of charity. We spend millions in taking care of these dependents. Would it not be true economy and equally just and appropriate to care alike for all children, who show beginnings of spinal curvature, defective vision or hearing, signs of consumption, or symptoms of nervous diseases of

every kind? These diseases detected in their incipiency could generally be cured, but they are of such a nature as to require medical skill for their detection.

Chronic diseases of all kinds often have their beginnings in environment. It requires a bacteriologist to detect the germs of disease. The state which provides a place for the assembling of children and does not provide for the prevention of contagion or any other disease, the germs of which could be detected by a competent expert, is morally responsible.

Compulsory attendance at school is fast becoming the law of the various states. We are thereby often requiring a child to attend school when he possesses some physical defect of sight, hearing or other bodily ailment, of which he is not aware, but which makes school life distasteful and a burden, and which might be easily detected and cured by a skillful physician. The state should demand attendance at school on the part of those for whom the schools exist, but it should also see to it that no child blindly suffers from a defect that could be cured.

A child physically defective so that he can not succeed well with his studies and gets behind his class grows to dislike school, and if his moral training is not of the highest standard he becomes a truant. It would be better to prevent dislike for school and truancy than to have truant officers and reformatories. It is better to lead the child in the right way by skillfully correcting all physical or mental defects and surrounding him with the proper environment than to build walls of prohibition and costly state penitentiaries. Do not wait till a criminal is made to reform him. Train him so he can not become one. Truly much is being done for the education of children, but much more can be done. The cost of a system of medical inspection would be more than saved in the lessened cost of the care of adult criminals and dependents.

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CONTENTS:

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The Survival Values of Play.

CONTENTS.

SURVIVAL VALUES OF PLAY.

I. INTRODUCTORY.

The educational value of play in the development of youth has long been tacitly recognized by the majority of observing people. While possibly unable to assign it any definite value, sympathetic adults have at least felt that time spent in plays and games has not been squandered, but on the contrary, that benefit has resulted. This phase of the subject had been emphasized by early writers, while Froebel by means of the kindergarten utilized the play activity as a distinct agency in formal education. Until the time of Spencer, however, no one attempted to investigate scientifically the philosophy of play,—its origin, nature and utility.

Spencer finds the origin of the æsthetic sentiments (1) in the play activity, an idea which he states was gathered from a forgotten German source. (2) The nature and origin of play are thus discussed as a preliminary to his main topic. Spencer, to account for the origin of play, evolved a surplus-energy theory, which may be succinctly stated as follows:—Highly evolved animals have developed many powers adjusted to many requirements which can not all act at once. Their more efficient organization, and hence better nutrition, gives a surplus of time and vigor not absorbed in providing for immediate needs. Hence many powers are inactive for considerable periods. (3) Active, healthy nerve centres during prolonged rest continually gather energy and hence in time "are brought to a state of more than ordinary instability—a state of excessive readiness to decompose and discharge," (4) which they do owing to the multitude of stimuli which are continually besieging the organism. "Hence play of all kinds—hence this tendency to superfluous and useless exercise of faculties that have been quiescent." Although he terms play activities as *superfluous and useless*, directed to proximate ends without

(1) Spencer, Principles of Psychology, Vol. II., Chap. IX. Appleton & Co., 1885.

(2) As Groos shows (The Play of Animals, Chap. I.), this source was Schiller, and the idea is again traced to Kant and Hume. Groos also maintains and is followed by Eby (The Reconstruction of the Kindergarten, Ped. Sem., July, 1900), that Spencer also derived from Schiller the conception of the nature of the play impulse. This is just possible, but by no means certain. It must be remembered that Paul, Beneke and Schiller treated the play impulse, although in a very vague and metaphysical manner, while the first scientific explanation was attempted by Spencer. In this connection see Wallaschek, Primitive Music, Note, page 232.

(3) Spencer, *op. cit.*, Vol II., p. 629, and Vol. I., Section 50. See also his Physiology of Laughter, in Illustrations of Universal Progress.

(4) Ibid, Vol. II., pp. 628-630.

ulterior benefit either individual or biological, yet he further admits that these activities "may bring the ulterior benefits of increased power in the faculties exercised" and "there results only the immediate gratification plus the maintained or increased ability," thus committing himself to the practicing or exercising utility of play. As to its psychological nature he speaks of satisfaction, gratification and pleasure, and that in play "there is a more manifest union of feeling with the action."

Karl Groos, in his two published works (1) gives to play a distinct biological importance. He finds the origin of play in instinct. To him "play is a veritable instinct." (2) Its utility is that of practice or preparation of the instinct for future service. In the ontogenetic development of animals "instincts appear before they are seriously needed," while the young are still under parental care. With phylogenetic nervous evolution comes natal weakness. Instincts are not "elaborated to their last and finest details," (3) and hence if brought into contact with a real environment would react imperfectly, subjecting their possessor to danger of extermination in the struggle for life. Play is thus an instinct-educator. Practice in play elaborates these imperfect instincts "to their last and finest details," fitting them to react perfectly to the coming environment. Thus through play natal weakness is not a disadvantage and phylogenetic nervous evolution is possible. Thus animals do not play because they are young, but "rather they have a period of youth in order to play." (4)

In discussing the instinctive origin of play, one must bear in mind that play and instinct are not entities, but are generic terms, referable to each of many individual activities. (5) The statement that play is an instinct means that each and every play activity is an instinctive activity, and to this exceptions must be taken.

A definition of instinct, (6) which Poulton believes will be generally accepted by Darwinian naturalists, gives as one element "a complex group of co-ordinated acts entirely congenital on its first occurrence." Translated into neural terms, this expression means that every instinct involves at least a discharge of nervous energy over a complex group of congenitally associated neurones. Groos himself, after a lengthy discussion, also defines instinct as embracing hereditary brain tracts. (7) Thus each and every play if instinctive, must embrace within the activity a congenital association of neurones. But in fancy, revery, day dreams, castle-building, puns, play lies, imagination, etc., we have a play in ideas involving the higher associational areas and it is difficult to conceive of any complicated congenital associations

(1) Die Spiele der Thiere, 1895, and Die Spiele der Menschen, 1899.
(2) Poulton claims that this same idea is not original with Groos, but had been developed previously by Robinson and Lloyd Morgan. See article by Poulton in Nature, Nov. 21, 1901.
(3) Groos, The Play of Animals, p. 74. Appleton & Co., 1898.
(4) Ibid, p. 75.
(5) Allin, Play, University of Colorado Studies, Vol. I., No. 1, p. 65.
(6) Poulton, Zoological Problems Studied by a Psychologist, Psychological Problems Studied by a Zoologist, Nature, Nov. 21, 1901.
(7) Groos, Play of Animals, p. 69.

in these regions. In fact they are generally conceded to be entirely plastic, free from congenital associations. Likewise may be mentioned myths, many stories and some fiction and poetry, which are largely plays among ideas, involving no congenital associations. Among neuro-muscular activities the same conditions obtain. Groos enumerates many cases dealing with the playful use of the senses and the motor apparatus. (1) He quotes Compayre: "I knew a little girl who would undertake to recite only on condition that she be allowed to use her fingers at the same time," (2) and mentions other such concomitant habitual activities usually termed automatisms. Carrying a cane, fanning for the sake of the touch stimuli, hand-clapping, banging on the table with the fist, hopping and skipping, the chewing and biting of pipe stems and pencils, and even gum-chewing are mentioned as plays and therefore from his standpoint instinctive activities. Besides there can be cited plays upon habits formed *de novo*, such as the finger movements of pianists when preoccupied. Plays in imitation of adult work activities as keeping store, keeping school, playing horse, preaching, etc., and plays based upon ancestral adult occupations handed down as a part of the social heritage, (3) such as the use of rice at weddings, Easter and Christmas rites, are also cases in point. In these last two classes of plays it is not maintained that none involve instinctive elements, nor is the wide prevalence of instinct in plays in general denied, but it is asserted that many of these plays, for instance those cases above mentioned, involve no congenital nervous associations and hence can not be properly termed instinctive.

These are extreme cases no doubt, but yet they are all true forms of play and Groos, to uphold his position, must affirm that in each and every case there is a discharge of nervous energy over a combination of neurones, a large number of which were functionally associated at birth. An exact determination of this fact in each case is extremely difficult, yet from the known facts of progressive medullation and localization of functions, as far as these cases are concerned, Groos' position is untenable, and hence his general statement that play is an instinct is also untrue.

Groos, in his first work, "The Play of Animals," in upholding the instinctive origin of all plays, commits himself to the doctrine upheld by James, Baldwin, Spencer, et. al., that imitation is an instinct, and hence imitative plays may be classed as instinctive. This argument is absolutely essential to the validity of Groos' instinct theory, as he himself would admit. There are many activities, as playing store, keeping school, etc., whose only claim to be termed instinctive is based upon the fact that they are imitative. If imitation be not an instinct, then it is doubly certain that every play reaction is not instinctive.

(1) Groos, Play of Man, Part I. Appleton & Co., 1901. Some of these plays receive their stimulus from instinctive reactions, e. g., the erotic passion, but many are pure intellectual plays and have no congenital references.

(2) Ibid, p. 10.

(3) Arthur Allin, Social Recapitulation, Educ. Rev., Nov., 1899.
Tylor, Primitive Culture, Vol. I., Chap. III. London, 1891.

In investigating this doctrine of the instinctive nature of imitation, one must bear in mind that imitation, like play, is a generic term referring to a number of individual cases of imitative activity, (1) and that if the doctrine be true, each and every imitative act must also be an instinctive act, i. e., each individual reaction must possess within itself both the characteristics of instinct and imitation, and hence an imitative act necessarily involves congenital nervous co-ordinations, if it always be instinctive. Many imitative acts certainly do possess this essential characteristic, especially those cases of imitation among lower social animals, the nursing plays of little girls, courtship plays, etc., while if we consider the wide extent of imitation in society as elucidated by Tarde, Royce, Baldwin, et. al., the greater majority of cases in highly evolved societies just as certainly do not. People imitate each other's manner of gait, of talking, of tipping the hat, etc. Children imitate abnormal peculiarities such as squinting, limping and chorea. Imitation is conscious and voluntary as well as unconscious, and one may imitate in another, relatively speaking, any activity he chooses, whether it be acquired or not. With the exception of the exciting stimulus, the two activities are identical in every respect and if the copy embraces acquired reactions only, the imitative act must also, and hence not embrace that essential characteristic of instinct, a congenital neural co-ordination. The assumption that imitative acts are also always instinctive requires a latent congenital nervous association for every reaction possible to be imitated, a requirement quite contrary to the facts.

Another weakness of the instinct theory of imitation Groos (2) himself calls attention to, viz., that if imitation be an instinct and play is a practice of instincts, then imitative play would be the means of practicing this imperfect instinct to functional maturity. A child would imitate playfully to strengthen a weak tendency whose development is essential in adult life. This assumes that imitation was once strong in the phylogenetic series, but has become weakened with the increase of plasticity, but as a matter of fact the contrary is true; imitation has increased in strength and amount as we ascend the scale in plasticity and intelligence. Again the position would assume that the tendency to imitation is weak in children and well developed in adults, a condition quite contrary to the general assumption. Groos sees the inconsistency of this position and makes an exception to his practice theory, assigning to imitative play the same biological and sociological function that is generally given to pure imitation. This position is also open to criticism. Play and imitation are each reactions with certain qualities. An imitative play consists of both characteristics united in one reaction. If imitative play has evolved and survived it must have a specific function not possessed by a pure imitative reaction. Ascribing to imitative play the same function as imitation explains the imitative part of the activity, but it has no bearing upon the play side of the reaction. What is the use of adding play to imitation when the pure imitative reaction will accomplish the necessary result? This question Groos does not meet.

(1) Arthur Allin, Play, *loc. cit.*, p. 65.
(2) Groos, Play of Man, Note, p. 289.

Summarizing, the instinctive nature of many plays and many imitative acts is not questioned. However, it is strongly asserted that many concrete plays and imitative reactions do not possess that essential quality of an instinctive reaction, viz., a complex group of neurones functionally associated by heredity, and hence Groos' fundamental proposition of the instinctive nature of every play reaction is not true.

For considerations like these, Groos in his second work abandons the instinctive nature of play and imitation and grounds both in a natural or hereditary impulse (1) without, however, abandoning the biological utility of play. Groos in his second position does not define clearly and succinctly "hereditary impulse." In fact he uses the term in a very general and loose manner, and half admits that he himself is not clear as to its meaning. (2) In his use of the term, however, he most clearly develops its meaning in discussing the nature of imitation, and as a consequence these instances have been chosen in elucidating and criticising his second position. However, the same argument is equally applicable to play.

Groos says, "I committed myself in my former work to the designation of imitation as an inborn instinct, and yet I must admit the logical inconsistency of this, since the very conception of instinct dispenses with the use of imitation. . . . . 'To assert that imitation is instinctive,' says Bain, 'is to maintain the existence of an infinity of pre-existing associations between sensations and actions' (Senses and the Intellect, p. 408). This appears to me to be the one insurmountable objection among the many which he and others have brought against the conception of imitative instinct, and it is serious enough to cause me to modify my former position." (3)

In developing his conception of hereditary impulse, Groos admits the force of ideo-motor activity in imitation, that a perception of a movement to be vivid and complete must have muscular sensations as an element of the idea, and therefore every vivid perception of a movement in others would involve a like tendency in ourselves. But granting the truth of this ideo-motor conception he says, "yet this is only a *necessary condition* of imitation and does not account for the *amazing force of the impulse.*" (4) Again, "This tendency of movement ideas must have special grounds furnished by organic needs and especially those which are instinctive; when the general idea of movement is coincident with one of these, the impulse toward discharge becomes very strong." (5) That is, if we have a number of different tendencies to imitation inherent in a number of movement perceptions, one is completed as an imitative act, while the others remain uncompleted as pure perceptions. Why is this? Groos argues that there must be a difference in the nervous centres themselves and infers that the difference is one of hereditary impulse. The inference is not entirely a happy one.

(1) Groos, Play of Man, p. 375.
(2) Ibid, pp. 2, 3 and 377.
(3) Ibid, pp. 284-5.
(4) Ibid, p. 285. Italics added by writer.
(5) Ibid, pp. 288-9. Italics added by writer.

Suppose a child sees twenty movements, each of which is a strong stimulus to imitation and yet the child reacts to one to the exclusion of the other nineteen. The reason may lie in the stimuli as well as in the centres. The reactive effect of stimuli varies according to their strength, their persistence, i. e., their cumulative effect (summation of stimuli), rivalry among induced images, and their relation to preceding or concomitant stimulations. A number of circumstances among the stimuli themselves may determine which produce a reaction and which do not. But granted that two stimuli are equal in their reactive possibilities, one may release a vigorous reaction, while the other may produce no noticeable result. In this case the difference is in the condition of the nerve centres. The one may possess an abundance of energy and be very irritable or susceptible to stimuli, while the other is in a fatigued or depleted condition. That to which Groos refers as the characteristic quality of an hereditary impulse which explains play and imitation is this relative instability or forceful reactibility of nerve cells to appropriate stimuli. All that is necessary to predicate of this "hereditary impulse" in order that it may fulfill its necessary function in imitation, i. e., explain why one movement is imitated in preference to another and why it is performed with "amazing force," are the two factors, "a surplus of stored energy," and "a relatively great susceptibility to stimuli."

This is exactly Spencer's theory of play; that certain centres store a "surplus of energy" and that this of necessity renders them exceedingly susceptible to stimuli. There is this difference, however: Groos limits these qualities to hereditary impulses; Spencer makes no definite limitations.

Groos is certainly right in ascribing these qualities of instability and forceful reactibility to hereditary impulses, but errs in not ascribing them to other centres. Surplus energy is one condition of cell instability or that state of readiness or preparedness for reaction. Fatigued or depleted cells require a strong stimulus before reacting. Fatigue and susceptibility to stimuli, generally speaking, vary inversely to each other, so wherever we find this forceful reactibility, we would also find instability.

These qualities are found in instincts as they are in a state of functional preparedness for reaction at birth. The neurones are medullated, and means for securing nutrition are at hand.

Again they are found in well-ingrained habits as the relative amount of energy taken to centres depends upon their functional activity. The stimulating effect of exercise is based upon this fact. Use a muscle and it grows in size and power. Practice initiates habits and habit is a state of functional preparedness for a certain reaction. Habits are very susceptible to stimuli and react readily and even automatically. Physiologically habits are identical with instincts. They both have the same qualities of good nutrition, instability to appropriate stimuli, and functional preparedness for reaction. The physiological properties are common to both; in instincts they are present at birth, in habits they are acquired.

The same conditions are found along lines of growth and development. Nerve centres while developing at different times in the life of the young

from the state of neuroblasts to functional maturity are the scene of great physiological activity. They increase in size and number of prolongations, means of nutrition are increased and they are at their nascent period extremely irritable to stimuli, giving rise to many of the child's spontaneous reactions, interests, tendencies and desires. These developmental characteristics are often falsely termed instinctive. They are rather **innate** in that they are a necessary result of life and a hereditarily prescribed order of development of the nervous system. They are no more truly instinctive than growth or even life itself. For example, take the development of the Rolandic and associational areas. Corresponding to these as a necessary result of their development, there would be an excess of motor movements, or a great activity in associated thought and the finer coordinations of movement. These are certainly congenital, but the reactions are general in nature, not definite and specific. Before any of these reactions could be termed instinctive, there must be a congenital development of the centres, *plus definite, specific and congenitally prescribed co-ordinations of neurones so that definite and specific reactions occur.*

This readiness for reaction, inasmuch as it is based upon a surplus of stored force and excellent conditions for securing nutrition, implies a forceful reactibility, is characteristic of instincts, well ingrained habits and lines of growth and development, and is also one of the physiological factors of impulse.

Impulse, like instinct and imitation, is not an entity; it is a generic term applicable to a number of individual concrete phenomena. An impulse is simply a tendency toward a particular movement, the movement, for the time, being uncompleted owing to inhibition or other causes. It may be congenital, i. e., based upon instinct, or acquired, i. e., based upon habits or have its anatomical basis in centres not yet definitely organized.

Groos recognizes that "hereditary impulse" does not cover all the facts in the explanation of play and imitation and in consequence is driven to strange admissions. He says, "In this dilemma we can only hold fast to the fact of the primal need for activity," and further speaks of a universal "impulse to activity." (1) Again he suggests a return to the faculty theory of psychology and expresses his belief in a "central instinct or central impulse," (2) although he admits that the idea can be but vaguely defined.

These general statements of Groos are very unsatisfactory. In a way we do have a "primal need for activity" or "an impulse to activity," but not in the sense that they are due to an hereditary functional combination of nerves. Activity of some sort is an essential characteristic of life. Given an organism which is continually generating energy and place it amidst continual stimulations, i. e., assume life, reactions of some sort must occur. We might say that activity is congenital or innate the same as life or growth, but not instinctive. The principle of life is sufficient and there is no necessity of assuming any hereditary functional combinations of nerves, or central instinct of activity.

(1) Groos' Play of Man, p. 3.
(2) Ibid, p. 377.

Again it is objected that many play movements of animals are peculiar to the different species, and that a peculiar functional organization of nerves—instinct—is the only possible explanation of this fact. The fact noticed is true and as emphasized by Spencer (1) instinct does explain a great number of these peculiar movements, but it is not the only explanation. As shown before there is a regular order of development of the nervous centres with corresponding peculiar movements. These movements to some extent vary in character in different species, but it is because the animals have a peculiar congenital nervous *development*—not a peculiar congenital functional nervous *organization.* Again a large percentage of these movements characteristic of the different species may be explained by a peculiar anatomical arrangement of the nervous system and musculature. Suppose all habitual and instinctive tracts in two animals of different species be eliminated and their nervous system be entirely plastic. Yet, say in the case of an elephant and a snake, if nervous energy be liberated in the higher centres and it spread to the musculature, movements characteristic of the species would occur in each animal because it possesses a specific anatomical structure. No peculiar functional association of neurones need be assumed to explain this fact, and the argument of the specific nature of play movements does not establish the instinctiveness of each and every play reaction.

In conclusion it will be noticed that if Groos limits the qualities of instability and forceful reactibility to hereditary impulses alone—those based upon instinct—his position is open to all the objections urged against the pure instinct conception of play, while the essential characteristic of his final position is really identical with Spencer's surplus energy theory which he attempts to overthrow.

The biological doctrine of evolution at present generally accepted is: that successful evolution in the animal world has been along the line of an increase in functionally unconnected nerve elements—an increase of plastic endowment, (2)—and that this of itself necessitates natal weakness; but this natal weakness would be destructive of the young and hence of progressive evolution unless this disadvantage were counterbalanced by other preservative factors. Hence natural selection has favored two necessary and essential factors, 1st, a shielding of the weak young from the incidence of natural selection,—parental care—and, 2d, neural organization of the helpless young to an adaptive maturity—education. Thus these two

(1) Spencer, *op. cit.*, p. 630-2.
(2) Fiske, Outlines of Cosmic Philosophy, Vol. II., pp. 342-369.
Butler, Anaximander on the Prolongation of Infancy in Man, Classical Studies in Honor of H. Drisler, N. Y., 1894, pp. 8-10.
Hammarberg, Studien Ueber die Idiote, Upsala, 1895.
Sutherland, Origin and Growth of the Moral Instinct, 2 Vols., 1898.
Donaldson, Growth of the Brain, pp. 74, 238, 240. Scribner's, 1898.
Chamberlain, The Child: A Study in the Evolution of Man, pp. 1-37. Scribner's, 1901.
Barker, The Nervous System. Appleton's, 1899.

factors have no value in themselves; they are but subservient means to a greater end. They have value and have come into existence only because they have aided in that ultimate goal of evolution—the progressive efficiency of the race. (1)

Thus this *whole* educational-adaptive process has a biological utility and it consists of so many adaptive organizing sensori-motor reactions. These reactions have different characteristics and accordingly may be roughly (2) classed as (1) play reactions, (2) work reactions, and (3) subsidiary, complementary or automatic reactions.

Groos asserts that play has a special exclusive utility within this educational field because of its special exclusive nature. Play reactions are instinctive in nature and their utility is that of practice, i. e., they are that part of the educative process which deals with instincts and hereditary impulses. The play reactions have exclusive province as instinct-educators. The validity of this special province of play within the educative process alleged by Groos is of course dependent upon the validity of the instinctive nature of play and this position has been shown to be untenable.

Nevertheless, play still has a biological function, not because it is a special form of reaction, but because it is a part of the educative process. But the same is equally true of the work reaction. Groos' aphorism that we do not play because we are young, but are young in order to play, is but a part of the truth. The same may also be asserted of the work reaction, while the entire truth is rather that we are not *educated* because we are young, *but are young in order to be educated.*

The whole question as to the relative province of play and work in the educative process is thus open to investigation. It is evident that the work and play reactions have many utilities in common; these have been termed the "general utilities of play." However the play reactions have certain peculiar qualities by reason of which, they are better adapted for service within this general field than any other reaction. These are termed the "special utilities of play" and they are such as would lead to the selection of those reactions within the general utility field. The "Survival Values of Play"—the subject of this thesis—includes both the general and special utilities. Since these special utilities depend upon the peculiar and essential qualities of the play reaction, the nature of play and work must first be determined.

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(1) Arthur Allin, The Law of Future Specific and Social Efficiency (unpublished).

(2) This represents no accurate classification. It represents rather three general groups of activities, sufficient for the purposes of this discussion.

II. NATURE OF PLAY AND WORK:

As indicated above a strict analysis of Groos' final position as to the nature of play demonstrates its probable identity with the surplus-energy theory enunciated by Spencer. (1) As shown before the instability of a cell, barring variations in the nature and strength of the stimulus, depends upon the strength of the cell relative to the amount of energy within. Those centres which possess means for readily securing and storing nervous energy would be extremely sensitive to stimuli, extremely ready to react. These centres were found to be those involved in (1) instincts and congenital impulses, (2) well ingrained habits, and (3) those at their nascent period of growth and development.

The nervous system is continually besieged by thousands of stimuli. Besides the many conscious sensations of light, heat, pressure and the more definite stimuli received through our special senses, we are subject to variations in the weather, thermometric and barometric conditions, conditions of moisture, sunlight and winds, (2) the many tropisms, (3) and the varying condition of the viscera. These, although unperceived, nevertheless affect us profoundly, giving rise to many of our moods, day dreams and idle thoughts, (4) our random spontaneous muscular movements, mental and physical automatisms, (5) and our play reactions. As Spencer says, these stimuli are continually "reverberating" (6) through our nervous system, and unless inhibited or directed, would cause reactions in centres of least resistance to stimuli, centres most susceptible or sensitive. Hence we would find random spontaneous activities and play reactions involving (7) *a*, instincts and congenital impulses, *b*, well ingrained habits, and *c*, centres at their nascent period in growth and development, which last group embraces the non-instinctive plays described by Groos under the heads, "Play-

(1) Also accepted by Wallaschek, Primitive Music, p. 232. He also suggests (p. 272), on excellent grounds, the use of the term "unapplied energy" for "surplus energy."

(2) Dexter, Weather and Conduct, Psych. Rev.
Dexter, Weather and Suicide, Psych. Rev.

(3) Loeb, Physiology of the Brain, Chap. XIII. Putnam's, 1900.

(4) Waldstein, Subconscious Self. Scribner's, 1897.

(5) C. E. Partridge, Reveries, Ped. Sem., Vol. V., No. 4.
Partridge and Lindley, Some Mental Automatisms, Ped. Sem., Vol. V., No. 1.

(6) Barker in his chapter on the Irritability of the Neurones (Nervous System, Chap. XXI.) very strikingly describes the unremittant character of nervous activity due to continual stimulation.

(7) The usual opinion concerning the views of Spencer and Groos is that both theories represent truth, but that neither by itself is a complete explanation of the play phenomena. Attention is here called definitely to the fact that the surplus-energy theory as developed above would embrace and include that of Groos as a constituent element. As noted before, Spencer distinctly and repeatedly states that play would involve racial and congenital reactions, and in fact he devoted most of his space to elaborating this idea and stating facts in support. It is strange that with his critical attitude toward Spencer's position, Groos should overlook such an obvious fact.

ful Use of the Sensory Organs," (1) and "Playful Use of the Motor Apparatus." (2) Roughly then the physiological criterion separating play and random activities from work would be a discharge of energy in centres of least resistance to stimuli—centres with an abundance of stored force—while the psychological criterion would be a lack of the feeling of strain and effort.

Any definite distinction between play and spontaneous random activities is difficult to make. As in the case of plant and animal life, so here the two classes merge into each other and the distinction must necessarily be general and relative. The difference may best be seen in the case of a baby. Movements of the limbs with a more or less quiet condition of the body we at once term spontaneous, yet exactly the same reaction performed with more vigour and accompanied by sparkling eyes and a general excitation of the rest of the body, we invariably call play. A certain brightness of the eyes is an invariable accompaniment of a pronounced play reaction and Darwin explains this brightness of the eyes during pleasurable states as due to distension by arterial blood and a consequent contraction of the orbicular muscles to prevent a possibly harmful engorgement. (3) It is generally assumed that there is a rush of blood to functioning centres, the amount being proportionate to the intensity of the reaction. (4) Mosso has shown by the plethysmograph that the slightest thought or act of attention causes a vaso-motor reaction. (5) Dr. Anderson has followed the same line of investigation, devising what is termed a "muscle bed." The subject is placed prostrate upon the apparatus and perfectly balanced so that the least change in the centre of gravity can be recorded. Even the thought of a movement in the leg would cause such a determination of blood to that organ as to effect a change in the equilibrium, while an idea of a movement which is habitually attended by pleasure and delight, that is of the play nature, caused a quicker and more decided vaso-motor reaction. (6) Thus the chief characteristics serving to differentiate play from random activities would be the intensity of the reaction, coupled with a general excitement of the body and an exhilarating vaso-motor reaction. (7)

Most writers, including Groos and Spencer, agree probably from introspective grounds in ascribing pleasure to play as one of its chief and distinctive psychological accompaniments. The question as to the physiological accompaniments of pleasure is one of the old and mooted questions of psychology. A critical analysis of the widely prevalent theories is here impossible. Henry Rutgers Marshall, in his Pain, Pleasure and Aesthetics, after a critical review of all the facts comes to the conclusion that a dis-

(1) Groos, Play of Man, Part 1., Chap. 1.
(2) Ibid, Chap. 2.
(3) Darwin, Expression of the Emotions, pp. 148 and 206.
(4) Hartwell, Report of the Physical Training Conference, Boston, 1889. p. 10.
(5) Mosso, The Mechanism of the Emotions. Clark University Decennial Celebration Publication, 1899.
(6) Public Opinion, Jan. 23, 1902, p. 114.
(7) The great emotional reaction in games of chance is well described by France, The Gambling Impulse, Amer. J. of Psych. XIII. 3.

charge of surplus nervous force, wherever the energy involved in the reaction to a stimulus is greater in amount than the energy which the stimulus habitually calls forth, (1) is the only invariable accompaniment of pleasure and hence is the physical stimulus arousing the pleasure state in consciousness. This hypothesis would make the pleasurable state a result of a reaction in centres possessing surplus energy. These stimuli, like all others, would not affect consciousness unless possessing volume and persistence, that is where there was a general and intense reaction. This theory of Marshall's as to the physiological basis of pleasure seems to be the best explanation at present, and as will be noticed the physical accompaniments of pleasure are almost identical with those given to play. If pleasure is an invariable characteristic of play this coincidence was to be expected.

Such physiological conditions as described above as the basis of the play reactions do not exist in such simplicity in one activity. Play activities, sports, games and work reactions are complex in nature, each embracing many reacting centres in various parts of the body. Each activity is a combination of many elements—muscular, neural, vaso-motor and glandular reactions—a combination varying from moment to moment. In the many reacting centres forming the one complex activity, there may be all variations from surplus energy to fatigue, from unregulated discharge to inhibition and rigid regulation. The whole does not consist entirely of play elements, but of other elements as well, the relative number of which may vary from moment to moment. Each element would tend to affect consciousness through the afferent nerves. Consciousness does not discriminate between elemental sensations. The entire activity is regarded as a whole and is either work or play, according to the predominant state of consciousness. Nor do these innumerable sensations necessarily fuse into a whole. It is rather a case of domination by some and exclusion of others, just as we consciously attend to but a few of the thousands of stimuli which are continually striking our organs of sense. The strength and persistence of stimuli and inhibition by other conscious states are determining factors in attention. Thus football is characterized by strain, intense effort, almost exhaustion, inhibition and rigid regulation of many of the elemental activities, and yet they do not dominate in consciousness during the game. Persons thoroughly enthused in a boxing contest rarely notice even the pain of a severe blow, owing to the concentrated state of the attention.

Groos' criticism of the surplus energy theory may be easily met in this connection. Children will play when exhausted and tired from work. So a kitten although exhausted by play will again spring after a rolling ball, or dogs who have raced about the garden until they are obliged to stop from sheer fatigue and lie on the ground panting, with tongues hanging out, will again resume their chase on the slightest provocation. (2) Groos argues that if there be fatigue and exhaustion and still play, the theory of surplus energy fails to meet the facts, and hence these cases must be regarded as instinctive. But in the case of the dog the question is equally pertinent why

(1) Marshall, Pain, Pleasure and Aesthetics, p. 204. MacMillans, 1894.
(2) Groos, The Play of Animals, pp. 19-20.

did the dog stop at all if the activity was instinctive. Groos answers that of course energy is a *sine qua non* to the reactions of instincts, that even they will not act continuously without rest. The inference is that it was necessary for the dog to rest a few moments in order for the instinctive centres to recuperate their store of energy. This is undoubtedly true and yet Groos denies the same explanation in the case of the surplus energy theory. In either case the reacting centres, whether instinctive or in a condition of irritability due to an abundance of force, have a few moments of rest in order to recuperate to their former state of irritability. The only difference between the two is in the necessary amount of recuperation and the time employed, and it is extremely doubtful if it is necessary to assume a longer time in the latter case. "Stored force" is rather an unfortunate term, for it is doubtful if nerve cells store any great amount of nervous energy; the term means rather conditions for securing an abundance of energy readily and quickly; it refers to an abundance of supply rather than to an abundance actually stored within the cell. Any cell is quickly exhausted if continuous demands be made upon it, while a rest of a few seconds is sufficient for recuperation. (1) The heart muscles have but a few moments for rest. Rhythmical exercises find their great value in this fact and tetanized movements are consequently condemned. (2) This proves that the process of relief occupies but a short time, Mosso proving that a few seconds are sufficient for neural cells, so quickly do they recuperate. Groos' objection in the case of the dogs is no more valid than may be urged against the instinct theory on the same grounds, and we must add to this the fact that in play there is a quickened vaso-motor reaction and the centres in question are bathed with a greater blood supply, ensuring more nutrition immediately and a readier relief from the toxic conditions of fatigue. (3) There is no reason why in play there should not be an immediate recuperation to a state of forceful reactibility demanded by the surplus energy theory. Again in the case of the children who will gladly answer the summons to play when tired out and exhausted by work, the composite nature of our reactions must be remembered. The fatigue may be limited to some centres while there is an abundance of vigour in others. The play reaction may dominate in consciousness and the fatigue be entirely forgotten or unnoticed for the moment. Further the consequent quickened general circulation of the blood may be the very best means for relieving the fatigued centres. (4)

Summarizing we see that a pure play activity consists of a discharge of a relatively great amount of nervous force involving exhilarating vaso-motor reactions and a more or less excited condition of other parts of the body, giving rise in consciousness to a state of comparative pleasure, exhilaration and power, with a lack of the feeling of strain, effort or fatigue; that our activities as wholes are complexes involving such a variety of elements within the single activity that they can be characterized by no distinct physiological criteria; that the single activity must be regarded as either work or

(1) Mosso, Psychic Processes and Muscular Exercise, *op. cit.*, pp. 338-390.
(2) Sargent, Report of the Physical Training Conference, p. 75.
(3) Donaldson, Growth of the Brain, p. 312. Scribners', 1898.
(4) Ibid.

play according to which of these elemental reactions dominate in consciousness and hence the only possible criterion of the whole activity must be subjective; and that play refers to those activities which are accompanied by a state of comparative pleasure, exhilaration, power, and the feeling of self-initiative.

In pure play, the particular reaction is determined mainly from within, that is, it involves centres with the greatest susceptibility for reaction; pure work on the other hand is a particular reaction imposed from without; it is an adaptation to external needs and necessities; it may or may not coincide with the individual's tendencies, interests and desires. These are not considered. Something must be done, and the reaction is adapted primarily to this rather than to internal conditions of the reacting centres. A boy left to himself may run, jump, throw, or indulge in flights of fancy and imagination, the particular centres reacting in each case, the continuance or change to another reacting centre, the inclusion or exclusion of certain co-ordinations, are adapted to the boy and have no direct reference to external factors. In work, sawing wood for instance, a definite, particular and continued reaction is demanded. The tendency may be for the boy to use his legs at this particular time, but this factor is ignored. Change in the functioning centres—the element of whim and caprice—is reduced to a minimum. A particular and continued movement of the arms and none other is here demanded. Again in pure free play no attempt at precision and accuracy of movement is essential. Liberated surplus energy in the higher centres instead of taking a definite channel to the periphery may "overflow" and introduce non-essential concomitant movements. This is a general result of intensity of reaction seen in rage and strong emotions, involving a general diffusion of energy. In work precision and accuracy are largely demanded. The liberated energy must be confined to definite channels. In piano practice, the movements must be precise and accurate, other concomitant movements being detrimental and hence inhibited. In scientific work the teacher must see that definite and precise associations are made and that speculation and fancy are inhibited. Facts must be associated in a prescribed way. The opposite of pure play would be regular, definite, precise and continued reactions imposed by external conditions; it would be the machine-like activity—hard, cheerless toil.(1) Our common work activities, like play, are complex in nature, embracing many reactive elements. Again there is no absolute and definite criteria between the two activities. It is almost impossible to distinguish any real and vital difference in the activities of solving some puzzles, and many of the "puzzle problems" found in the older arithmetical text books. Work in its purest form exists in the drudgery and routine of menial positions, while occupations involving change, variety, excitement and self-initiative approach the play reaction. Since these elemental reactions vary within the whole activity but affect consciousness as a whole, the only criterion is the subjective, and work would refer to those activities accompanied by a predominant sense of strain, effort, inhibition, constraint and rigid regulation.

(1) Allin, Play, p. 73.

III. GENERAL UTILITIES OF PLAY.

The general utilities ascribed to play may be roughly classed as follows:

1. Diversional.
2. Kathartic.
3. Alleviating.
4. Recuperative.
5. Practising.
6. Educative.
    - A. Exercising.
    - B. Organizing of
        - a. Instincts.
        - b. Instinct-habits.
        - c. *De Novo* habits.
    - C. Transmission of the Social Heritage.
7. Sociological.

1. A pure diversional play is one whose sole object is to "pass away the time" where the customary work activities are not sufficient to engross all of the individual's time and energy. A pure diversional play is but rarely seen. Playing solitaire, reading novels, many of the amusements of the idle classes and old people are instances in point. They are characterized by a minimum of energetic activity and definiteness of reaction, and easily pass from the province of play into idle random movements. The value of play in this connection is in the fact that it serves the purpose with a minimum of exertion on the part of the individual.

2. Aristotle first applied the term "katharsis" to the effect of the tragedy upon the emotions of pity and fear (1) and, whatever meaning he attached to the term, there is no doubt that it represents an important psychological truth. The tragedy is a stimulus exciting certain intellectual and emotional states in the observer similar to those of the actor. The emotional reactions are instinctive, once extremely useful, but of less utility at present, and under certain conditions positively anti-social. These reactive centres are nevertheless prepared for function, i. e., they continually gather energy and become susceptible to stimuli, and are liable to react at inopportune moments. Uncontrollable outbursts of passion to trifling stimuli are instances frequently occurring. The tragedy, by inducing these emotional reactions in the observer in a weakened form and under fictitious circumstances, would drain away this potently harmful energy into harmless channels. The individual would be "purged" or relieved of this possibly anti-social energy. The same argument is equally applicable to all emotions and hence to all the aesthetic arts. (2) The similarity with play is also apparent. The play reaction involving centres of surplus energy would drain them of this extra force. Katharsis, however, implies the idea of purging or a draining of that energy which has *anti-social possibilities*, and hence the kathartic value may

(1) Butcher, Aristotle's Theory of Poetry and Fine Arts, pp. 238-268. McMillan, 1898.

(2) Hirn, The Origins of Art, Chap. VIII. McMillan, 1900.

be predicated of only certain play reactions. The value of football, boxing and other physical contests in relieving the pugnacious tendencies of boys is readily apparent as examples. Without the numberless well organized set forms of play possessed by society which give a harmless outlet to the mischievous and unapplied energy of the young, the task of the teacher and parent would be appalling.

In all cases, the purging is effected by the *reaction* and it matters little whether it be play or work. Regular and continued labor as a rule is very effectual in this respect. It is generally those people of comparative leisure, or who have extremely specialized forms of vocation, that have the most need for the kathartic value of play and art.

While this function has a wide field among the young and even among adults, yet, as shown later (1), one task of education is to organize as much as possible these anachronistic instincts, emotions and impulses into a larger system of habits which have social utility. If this were done, these centres would still secure a purging in adult life, but not one wherein the energy is lost, but one wherein it would be utilized for social service.

3. In reactions marked by intensity and enthusiasm, there results a certain concentration and fixation of the attention and hence distracting and disturbing stimuli have no reactive effect upon consciousness. For instance, a lecturer may suffer from a severe toothache or other painful sensations, but during the intense excitement and concentration of thought and effort in an enthusiastic address, the pain ceases, but only to return shortly after the lecture. The pain stimuli were present throughout but did not affect consciousness. The speaker had been temporarily anaesthetized, and the probable explanation is that in a state of intense concentration of attention there is a flux of blood to the reacting centres and a state of comparative anaemia or non-reactibility to stimuli in surrounding centres. The same stimuli storm the body as before, but they have no reactive effect. Other reactions are suppressed and the hyperaemic centres hold full sway. This explains the use of drink in depression, sorrow and trouble, and the many amusements and hilarious carousals of adults seeking to temporarily forget the cares and worries of the world. Owing to the intense emotional conviction or emotional monoideism of the mediæval martyrs, they were known to be consumed by the flames with a smile of ecstacy upon their features. Savages use the vasomotor effect of music during childbirth, circumcision and other painful rites (2), and probably for this reason. Engage a child in an intensive play and its sorrow or anger quickly vanishes. Even hard, steady and intensive work is one of the best of antidotes for a state of sorrow. This alleviating effect is due to the fact that the other centres are drained of their energy and hence are not affected by disturbing and distracting stimuli.

4. The recuperative value of play has long been recognized. When a certain set of centres have been continually used, time for rest and recuperation is needed. At the same time, other centres have been in a condition of enforced idleness and owing to the accumulation of energy have need for

(1) See below the section on the organization of instinct-habits.
(2) Wallaschek, *op. cit.* p. 169.

movement. Play involving these idle centres has not only value for their relief, but also gives opportunity for rest and recuperation to the fatigued ones. But a change in the work activity could also subserve the same end. Other things being equal, play, the activity with the less strain and effort, would be selected. In this case a second reason may be adduced for the greater utility of play. Suppose a case of mental work involving comparative exhaustion and fatigue. There has been a more or less hyperæmic condition of the reacting centres with, probably, comparative stagnation in other parts of the body. A change of work involving muscular reactions of normal discharge and regularity could be undertaken, allowing of rest in the fatigued parts. There would be a determination of the blood supply to the new reacting centres with a comparative stagnation in others. The toxic condition of the blood due to mental fatigue would engender fatigue in the new reacting centres. (1) What is needed is a thorough vaso-motor reaction, involving the excretory organs, so as to rid the blood of its toxic conditions, with a determination of fresh arterial blood to the fatigued centres. This would best be secured by a true play activity with its general vaso-motor reaction.

5. The practising value of play as here used refers to the necessity of keeping in constant practice habits already formed but rarely used. "We get out of practice so easily," is the common saying in regard to activities which entail definiteness, precision and nicety of organization. The pianist must practice incessantly. Wallaschek emphasizes this point in his descriptions of primitive dramatic plays. Many of the hunting and war dances are a crude representation of the real activities of the hunt and war, and one of their values is to keep the participants in practice in all the necessary movements of those activities. (2) The jousts, tourneys and knightly combats in feudal times had this value. Professional and business men keep up their social habits, interest in literature, art and music as indirect aids to their all-round development and professional success. If play serves this purpose with a minimum of effort, it will be chosen. However, in the case of piano practice, where precision and intricacy are demanded, play with its irregularity and variability is detrimental. The precision and definiteness in the amount of the discharge and the inhibition of superfluous movements mean strain, effort and attention; it is the work reaction and is better adapted for this purpose.

6. The term educative refers to (a) the growth and development of the body during youth—exercising, (b) the organization of the neurones in various associations—organizing, and (c) the transmission of certain ideas.

A. It is well known that stimulation is necessary to growth and development to functional maturity. The experiments of Ambronn and Held upon a cat show that without stimulation the sensory neurones in the optic tract do not easily medullate or reach functional maturity. (3) Hence stimulation and activity, i. e., use and exercise, of any centre is a necessary condition to its rapid development, probably because of the increased blood supply. Ex-

(1) Donaldson. *op. cit.* p. 313.
(2) Wallaschek, Primitive Music, p. 274. Longmans, 1893.
(3) Mosso. Clark Decennial Celebration Publication, p. 384.

ercise of muscles increases the size of the cells, their irritability and motoric capacity. (1) Neural centres are subject to the same conditions. The neurones develop in size and elaboration of parts, there is a better regulation of irritability and a greater capacity in power due to their increased facilities for a storage of energy and a fresh supply of nutriment. (2) But muscular and neural reactions are interdependent. The activity of a neurone precedes that of a muscle. The whole is neuro-muscular involving two parts. Use and exercise of a muscle necessitates exercise of nerve centres. Hence motor education is both muscular and nervous, and is absolutely necessary not only for muscular development, but also for the development of a part of the nervous system including the Rolandic area in the encephalon. "Observations made upon the brains of persons born with an arm or hand lacking, taken in connection with those made upon the brains of persons who had had an arm or hand amputated, go to prove that the suppression or considerable diminution or certain movements brings about a condition of atrophy, or arrested development, as the case may be, in those centres which would normally represent such movements." (3) Inactive motor nerves grow weaker, become fattily degenerated, and finally lose all irritability, so that it becomes impossible even to think in the direction of movements to which those movements should give the impulse. (4) The afferent motor sensations form a part of our concepts, our mental resources. Few ideas are purely of special sense origin; they are associated with motor elements and these motor elements are an essential and integral part. That is, the development of the motor centres is essential to complete psychic life. Manual training, the kindergarten, laboratory methods, the dramatic sentence method in reading and other forms of motor activity have this common justification in educational practice. The education of idiots and imbeciles, of certain classes, in the Elmira Reformatory is begun and successfully prosecuted along these lines. (5)

Facts of this character emphasize the absolute necessity of activity in the growth and development of the young, and they are made a basis of the arguments of those who advocate the introduction of gymnastics in the schools. But is is the reaction rather than any special form that has value for this purpose, for any form of activity—whether the random spontaneous movements of a baby, play, games, gymnastics or work—has this same utility. The question is really not the importance of activity but the superiority of one form over the others for the purpose.

The young, either animal or human, if left to themselves, secure their development by spontaneous movements and play naturally. Activity of

(1) Jaeger, Problems of Nature, p. 112.
Hartwell, *op. cit.* p. 9.
(2) Ibid.
(3) Hartwell, *op. cit.* p. 13.
(4) Baron Nils Posse, The Special Kinesiology of Educational Gymnastics, p. 326.
J. Crichton Browne, Education and the Nervous System, in Book of Health, edited by Malcolm Morris, p. 327. Cassell & Co., 1884.
(5) See writings of Dr. Edward Seguin, Dr. H. D. Wey, Elmira Reformatory Reports, etc.

some sort is an essential characteristic of life, but why it should naturally take the free form of play rather than that of the effort and constraint of gymnastics is another question. One reason is that it involves centres with the greatest susceptibility to stimuli; that it secures the result with a minimum of effort, and so long as it secures its ultimate purpose there is no reason for the introduction of another activity. This would suggest that, other things being equal, there should be an extension of free play in the schools rather than the introduction of set forms of gymnastics; that regular courses in gymnastics, costly gymnasiums and appliances should give way for more extensive play grounds. Sargent recognizes this factor by saying that physical training may be a success with older men in the universities and turnvereins, but it is less adapted to the lower grades. It is impossible to secure enough activity by these means for the purposes of growth and development. Children must have the play element, (1) and even the play element has been introduced into the gymnasium at Amherst (2) in order to secure a greater amount of activity.

Another superiority of play in this connection depends upon its exhilarating vaso-motor effect. A spontaneous or a work activity would bring blood to the centres in question and further their growth and development, but would not necessarily stimulate other tissues in any marked degree. Sargent claims that vigour and rapidity involving a number of muscles at the same time are essential qualities of valuable muscular exercise. (3) Donaldson also says: "From the physiological side, that which rouses an interest tends to quicken the pulse and determine a full blood supply to the entire central system." (4) Anderson's experiments at Yale, quoted above, are conclusive on this point. Sargent gives interest in the activity as one of the ten cardinal principles of good exercise. (5) The best exercise must stimulate all parts of the body—the growth of the bones and other supporting tissues, and the healthy functioning of the visceral organs. (6) An activity which fails to arouse a vigorous vaso-motor reaction in all parts of the body fails in this respect. Dr. Jaeger argues in favor of English sports for this reason. He mentions the healthy physiological effect of pleasureable, joyful emotion, and the fact that prolonged depression (visceral stagnation of blood) is capable of inducing serious bodily disorders: "To this we must add the physiological influence of pleasurable excitement, which, together with the invigorating effect of bodily exercise, fresh air and so on, enhances the exchange of matter, and thus has a healthy and hardening effect upon the body. It is no exaggeration when I say that the high qualities to which the English owe their position as the principal colonizing, commercial and industrial nation of the globe are largely due to the high development of sports in the United Kingdom, as well as in the British colonies. There is a great difference between the train-

(1) Sargent, *op. cit.* p. 53.
(2) Ibid, p. 58.
(3) Ibid, p. 74.
(4) Donaldson, *op. cit.*, p. 356.
(5) Sargent, *op. cit.*, p. 74.
(6) Hartwell, *op. cit.*, p. 8.
Jaeger, *op. cit.*, p. 113.

ing derived from sport and that which is supplied from military drill." (1) Dr. J. Crichton Browne emphasizes the same fact: "Gymnastics are excellent in their way, and are particularly valuable in the correction of round shoulders, a slouching gait, and various local abnormalities, but they can never be a substitute for play. Such formal muscular movements are less varied than those employed in juvenile games, and sooner induce fatigue. Then the quantity of exercise taken in gymnastics is likely to be deficient, not only because of the lack of sustaining interest, but also because some muscles remain unexercised. Even when not made repulsive by being converted into appointed tasks, gymnastics often become distasteful from the absence of amusement in them, and hence the inferiority of such artificial exercises to the natural exercises that are spontaneously indulged in. An agreeable mental excitement has a highly invigorating effect, and happiness is one of the best of tonics; and thus mere frolic is more conducive to bodily and mental well-being than formal gymnastics. That gymnastics are useful in education cannot be denied, but that the benefits derived from them are inferior to those which flow from sports and pastimes may well be argued." (2)

No attempt is here made to disparage gymnastics nor to deny them an important place in education. Emphasis is merely put upon two essential characteristics of play which would naturally lead to the selection of those reactions for the purpose of the stimulation of growth and development.

B. The organizing utility of play is that part of the educational process viewed from the physiological and psychological standpoints which deal with the organization of the body through associations of plastic neurones. It embraces the development of weakened instincts (instincts, emotions, hereditary impulses and all congenital functional associations of neurones), the formation of instinct-habits, as well as of *de novo* habits. It includes all associations of vaso-motor, glandular, muscular and cortical reactions.

The development of weakened instincts is the main utility ascribed to play by Groos in his first work. Organic evolution has proceeded along the lines of an increase in our plastic endowment allowing of acquired adaptations to surrounding conditions. This has embraced a weakening of the instinct arcs. But in the lower animals acquired adaptations are not sufficient; these weakened instincts must be developed to their original form. The bloodthirstiness and ferocity of a young panther in pursuit of prey cannot be compared with that of its parents. All the actions and emotions necessary to this activity must be developed to their original form to ensure successful survival. Hence play with living and mock prey. Groos' position in reference to lower animals is correct, but with man, especially, the case is different.

Man possesses many of these old congenital, animal-like instincts and emotions, weakened of course and plastic, but yet certain to undergo some sort of development. They were reactions which were originally developed and adapted to an animal-like environment. Our fighting impulses, our emotions of hate and rage, our revengeful dispositions, are some of our ancestral

(1) Gustav Jaeger, *op. cit.*, p. 155. Written in 1878, but collected and published in 1897.

(2) J. Crichton Browne, *op. cit.*, p. 332.

inheritances, once extremely useful, but no longer so in their primitive form. (1) The biblical phrase of "an eye for an eye, and a tooth for a tooth," was based upon an actuality and not a theory. The environment has since changed. Man is now social. Habits of co-operation and subordination, instead of those of extreme mutual antagonism, have become increasingly necessary. Our ancestral reactions are no longer useful in their primitive form; they are now anti-social and anachronistic, nor can they be ignored in the educative process, for they are susceptible to development and elaboration, and in fact will develop in some way, be it social or anti-social. Society, consciously or unconsciously, must see to it that these springs of action are harnessed to social ends. They must be developed but at the same time "hedged round about" with acquired adaptations—habits of a social nature. It is a question not so much of their development as of their proper regulation and control. These plastic impulses through the grafting on of other reactions become the core of a larger system of reactions with a social reference. Instead of a development through practice to their original form, they are rather developed into instinct-habits adapting them to the new conditions.

Whether Groos recognizes this position is difficult to state. Certain it is that in his first work, he holds to the first view, that of practice and preparation. In his second work he gives examples involving the second position, and at times uses language which may be interpreted in this direction, (2) but at no time does he distinctly state the difference, and the criticism may justly be made that throughout he emphasizes the practice or development of the instinct, when he should rather have given emphasis to the "grafting on" of other reactions which will give to the whole a social nature.

An instance of this value of play may be seen in group games, e. g., football, which involves the fighting impulse to a great extent. The incentive is to vanquish the foe in certain prescribed ways. To the successful prosecution of this end, habits of emotional control, of co-operation, subordination and obedience to authority are necessary. (3) The direct fighting impulse is not developed; it is changed to healthy competition so regulated as to be social. Group games are a training *par excellence* in social habits of order, obedience, subordination and self sacrifice. According to Gulick, "These group games are played by Anglo-Saxon children, but by none others." (4) Whether this fact bears any relation to the democratic habits of order, social and political stability of the Anglo-Saxon people, is an inference worth considering. M. de Coubertin connects the reform in athletic sports by Arnold at Rugby with the Victorian era of political, social and moral progress. (5) At

(1) Hall, A Study of Fears. Amer. J. of Psych., Vol. VIII., No. 2.
Hall, A Study of Anger. Amer. J. of Psych.
Burk, Teasing and Bullying. Ped. Sem., Vol. IV., No. 3.
(2) Groos, Play of Man, pp. 2, 375.
(3) In games habits of subordination are seen which will put parental authority to shame. In football it is customary to see players accepting submissively, from the coach or captain, treatment which otherwise would not be tolerated for a moment.
(4) Gulick, Psychological, Pedagogical and Religious Aspects of Games. Ped. Sem., Vol. VI., No. 2, p. 142.
(5) Coubertin, Report of Phys. Training Conf., Boston, 1889, p. 114.

least it may be truthfully said that English sports and games are essentially democratic, while the German gymnastics are monarchistic in tendency.

As the Indian through torture, the war dance, blood-curdling stories of war and revenge, develops this fighting impulse to suit his peculiar social needs, and the Norseman by sagas, legends, epics, etc., inculcated habits of endurance and fierce reckless courage in war, so every society has evolved peculiar ways of controlling these impulses to their own peculiar needs. Nor is play the only means used. To-day this strongly aggressive and individualistic impulse seen in teasing and bullying, hazing and fighting is regulated by slaps, punishments, commands, inhibitions, the socializing effect of the play ground, education, etc., and directed to social lines of healthy competition, seen in the contests of business, the political platform, and the judicial arena. Play has no exclusive utility for this purpose.

Play also, as it involves developing centres and habits, is a means of organizing habits unassociated with instincts and hereditary impulses. Chess and mental puzzles organize neural associations. Myths, fairy stories, day dreams, etc., are plays among ideas, plays of the imagination, which physiologically are nothing but reactions involving new associations. Reveries to some extent are the play periods of the intellect; they stimulate growth and new associations and lay out lines for voluntary thought. (1) Non-instinctive movement plays and those involving the developing special senses perform this service in neuro-muscular activities.

But again play has no exclusive function. Even spontaneous reactions serve the same purpose to a limited extent, as for instance, the spontaneous movements of a baby's limbs and the unconscious formation of a large number of concepts in early life. Work performs the major part of this service, as seen in gymnastics, muscular work and the mental training of our schools and universities.

C. The transmission of ideas is a part of the educative function which is closely related to the organization of neural habits; in fact the two are interdependent. Legends, sagas, myths, poetry, songs and dances have among primitive people been their means of impressing upon the young their traditions, customs, history, ideals, religion, etc. No permanent means of record at that time existed. (2) Past ideas were transmitted through tradition. Interest, easy means for memorizing, and vivid impression were essential to preservation and were best secured through the song, the myth and the dance. All these means—this school for the transmission of past ideas—involved the play reaction. The same is being used to-day. Arithmetic is being taught under cover of the play reaction. The dramatic method in reading aims to secure a more vivid and lasting association between the idea and symbol. Signe Rink (3) describes her childhood in Greenland, where in play she dra-

(1) Partridge, Revery. Ped. Sem., Vol. V., No. 4, p. 462.
(2) It is an interesting fact noted by Major Powell that those Indian tribes whose religious rites are connected with dancing, say of the uninitiated: "He does not understand it, because he has not danced it out."
(3) Quoted by Groos, Play of Man, pp. 304-5.

matized the daily life of the Eskimos and thus secured a vivid, lasting and thorough idea of the habits, customs and life of these people. Miss Scott carries out the same idea in the Detroit Normal Training School, (1) and as a means of teaching elementary descriptive sociology the plan is invaluable. A maximum of result is secured with a minimum of effort.

Also among primitive people where, as in the case of war and hunting, the environment is absent, the young are instructed in these necessary activities through the dance. (2) The dance is a dramatic performance involving the whole hunting or war scene. The start, the journey, the hunt for the animal, the concerted action in the band, the movements and habits of the animal, all are faithfully depicted. The youth sees and finally participates, thus learning in the very best way the ideas and habits absolutely necessary for the social activities of his after life.

Imitative plays are also used naturally by children, thus learning easily and well many things in their present environment more easily and perfectly than otherwise. The street Arabs of East End in London were once accustomed to play constable, magistrate, and criminal. These plays were finally condemned by the London dailies because it familiarized the children with the ingenuity of the police, court proceedings, the tricks of criminals, and was intensifying vicious anti-social habits. (3) Ratzel mentions that where head hunting is a common occupation, the children have games founded upon it, having a cocoanut as the coveted trophy. Children's parties among the Indians are common, where little tots of four and five years of age are dressed up in paint and feathers, thus being early initiated into the customs and habits of the tribe. (4)

7. The sociological (5) value of play has been hitherto imperfectly recognized. It is true that group play and the school play ground have been of inestimable value in inculcating in the growing young social habits and feelings of immense value. The social effect of holidays, church festivals, fairs, etc., has been recognized in community life. But this has also been true in social development and has aided materially in the organization and growth of larger and larger aggregates. Individualism, more or less ex-

(1) Scott, Organic Education. Sheehan, Ann Arbor, Mich., 1897.
(2) Wallaschek, Primitive Music, p. 274. Longmans, 1893.
Grosse, The Beginnings of Art, Chap. VIII. Appleton & Co., 1897.
(3) Wallaschek, *op. cit.*, p. 275.
(4) Groos, Play of Man, p. 304.
(5) This classification is not intended to be strictly accurate. The educational, biological and sociological utilities all overlap. Any educative value from the standpoint of the individual child is also biological from a phylogenetic view, since education in its broader aspects is one of the essential conditions of biological evolution. Again there is no marked division between the biological and the sociological as the latter is a continuation of the former. The formation of many of the instinct-habits, and the transmission of the social heritage are also essentially sociological as well as educative. The utilities described in this section belong to that part of the sociological phase not already treated in the section on the educative value of play. This section refers, not to the education of the young into the existing social fabric, but to those means for securing a further social advance among adult societies.

treme, was once the predominant state. In the struggle for life the individual acted more or less as a unit, co-operated with and depended upon no one. Social development has proceeded along the line of increasing aggregations, each aggregate acting more or less as a unit in many matters of survival. The greater aggregation and the greater unity brought success. Individualistic habits must thus be supplanted by co-operation, dependence, subordination and unity of action within the group; egoism must give way to increasing altruism. In this process of socialization, play has served a function entirely equal, if not superior, to its biological utility described by Groos. The prevalence and importance of feasts, songs, dances, festivals and general merry-makings among primitive peoples can hardly be exaggerated. (1) One festival is reported as lasting for six entire weeks. (2) Irrespective of general antipathies, tribes for miles around are invited to participate on all important occasions. These large and general gatherings are the scenes of hilarity. Sympathy, good feeling and comradeship are engendered, making possible larger aggregations and a greater cohesion within the group. The same may be seen to-day in the songs and banquets of fraternities, national holidays, etc.

In the dramatic dances representing scenes of hunting and war there is a training in co-operation toward united action. Wallaschek comes to the conclusion that primitive music in connection with the dance and pantomime "is an organizing power for the masses, the tie which enables the tribe to act as one body. It facilitates association in acting. Tribes which know how to keep time, which are accustomed to play at war and hunting, associate more easily, act better in case of need, and, since association counts for something in the struggle for life, such tribes are better prepared for it." (3) "*The social significance of the primitive dance lies precisely in this effect of social unification.* It brings and accustoms a number of men who, in their loose and precarious conditions of life, are driven irregularly hither and thither by different individual needs and desires to act under one impulse with one feeling for one object. It introduces order and connection, at least occasionally, into the rambling, fluctuating life of the hunting tribes. It is, besides wars, perhaps the only factor that makes their solidarity vitally perceptible to the adherents of a primitive tribe, and it is at the same time one of the best preparations for war, for the gymnastic dances correspond in more than one respect to our military exercises. It would be hard to overestimate the importance of the primitive dance in the culture development of mankind." (4) Buecher (5) also shows the effect of the song and dance in securing habits of co-operation in work activities among

(1) Wallaschek, Primitive Music, Chaps. V.-X.
Grosse, The Beginnings of Art, Chap. VIII. Appletons, 1897.
Smith, The Religion of the Semites, pp. 252 ff.
Gummere, The Beginnings of Poetry. 1901.
(2) Grosse, *op. cit.*, p. 230.
(3) Wallaschek, *op. cit.*, p. 295.
(4) Grosse, *op. cit.*, p. 229.
(5) Buecher, Arbeit und Rhythmus. Fuenfter Theil. Teubner, 1899.

unorganized masses of men. But yet play can not be said to be evolved for this socializing function any more than it has an exclusive biological utility. Play is but one of the many agencies which have been used in social evolution.

In this chapter on the general utilities of play, it has been shown that those reactions have not had any exclusive function in biological, sociological or educational fields, and that any peculiar and exclusive utility of play for these purposes that would lead to its selection in competition with other forms of activity would be such as would depend upon its special physiological and psychological nature. These special utilities have been indicated in a general manner and yet remain to be discussed more fully.

IV. SPECIAL UTILITIES OF PLAY.

1. Ease of the reaction. Play involves centres possessing the greatest irritability to stimuli; centres with the greatest preparedness for activity. Unless there be outside direction, inhibition or regulation, it is the easiest or natural reaction They are the reactions we would naturally tend to perform if left to ourselves and freed from external necessity. Now so long as these activities would secure the diversional, recuperative, or educational ends as well as work, they would naturally be selected for that purpose; other things being equal play would tend to survive.

2. Play means a greater amount of activity. The general vaso-motor reaction involving a heightened circulation of the blood secures a continued and better food supply to the active centres and makes possible an earlier and more complete excretion of fatigue products (1) and thus the activity can be continued for a longer time. Sargent gives increased activity of the heart and lungs as one of the essential qualities of good exercise for this reason. (2) Wallaschek, after dwelling upon the exciting and stimulating effect of stirring music upon savages, mentions that a traveler observed that his rowers always began to sing when he compelled them to overcome their natural laziness and to continue their exertions. (3) The same writer says that savages are aware of the emotional (vaso-motor) effect of music and use it with good success in disease, (4) and probably it may possess its therapeutic value for this very reason. This is one of the reasons for the use of music in gymnastics. As before stated, interest and pleasure involve a quicker and more decided vaso-motor reaction to the active centres, and it is an accepted doctrine that where interest and pleasure can be suffused over an activity, it can be continued for a longer time and with less fatigue. Writers recognize that gymnastics fail in this respect. Because of the lack of a sustaining interest the

(1) Donaldson, *op. cit.*, p. 312.
Foster, Weariness, Nineteenth Century, Sept., 1893, p. 340.
(2) Sargent, *op. cit.*, p. 75.
(3) Wallaschek, *op. cit.*, pp. 165-6.
(4) Ibid, pp. 167-9. Certain tribes of Indians were accustomed also to take their sick into a room occupied by gambling parties. The intense excitement affected a high state of metabolism with beneficial results. France, The Gambling Impulse, Amer. J. of Psych., XIII:3, p. 405.

exercises are not continued until benefit is derived. In America the play element has been introduced into the gymnasium in a few places for this purpose, and Sargent mentions interest and pleasure as one of the ten prime requisites of good exercises. (1)

In play there is a greater variety of centres involved allowing of some alternation and rest. In work there is precision and definiteness of certain continually recurring reactions. Whim and caprice—change in the reacting centres—is reduced to a minimum; all is constraint and drear monotony. Thus fatigue is easily engendered and rest is a necessity. Play with its change and continual variability in reacting centres allows time for rest and recuperation and thus tends to a more continued activity.

The composite physiological nature of plays and games must be remembered in this connection, the whole being regarded according to those elements dominating in consciousness. When as in play, the pleasure and mental exhilaration dominate, there may be other sensations of work, strain, effort, fatigue, or even pain, which fail to affect consciousness, and hence have no inhibiting effect upon the entire activity. The individual elements are woven into a co-ordinated system which must be regarded as a unit and under the control of a single act of the will. If the fatigue or pain elements dominate in consciousness the reaction as a whole is inhibited. If the play elements dominate, the system proceeds to react as if there were no fatigue or pain elements. Children may be tired and yet if the play spirit be aroused and dominate consciousness, these fatigued centres may form a part of the play activity and have less inhibitory effect, so long as the play elements are uppermost in consciousness.

For these three reasons, play implies a more continued activity. Children will play all day when an hour of work is hardly possible. When tired out with work along certain lines and seemingly exhausted, they will energetically answer the summons to a game of ball. Thus for any educational purpose, other things being equal, more can be accomplished by means of the play activity than in any other way.

3. Greater intensity of reaction. Emotions—instinctive vaso-motor reactions—have evolved because of their service in the struggle for existence. At times it is necessary for a surplus of energy to be directed to the periphery to meet a crisis, at other times the opposite reaction is the most serviceable. (2) Play involves similar vaso-motor reactions and likewise secures an intensity of effort. (3) Through the vaso-motor reactions there is a concentration of energy in the reacting centres with a comparative drain of blood from other areas. As shown in the section on the alleviating value of play, because of the comparative anaemic condition of the drained areas, other disturbing and distracting stimuli have no reactive effect. The reactive centres reign supreme. There is a concentration and fixation of attention. The effect of music upon the rowers before mentioned has thus a partial explana-

(1) Sargent, *op. cit.*, p. 74.
(2) Sutherland, Origin and Growth of the Moral Instinct, Vol. II., Chap. X, 1898.
(3) Wallaschek's use of the term "unapplied energy," instead of "surplus energy" is in point here.

tion in that the stimuli of sight and sound coming from objects on the river bank have no effect. The attention is not divided; no other interfering or subsidiary reactions are stimulated; there is no interference or loss of energy; the whole energy of the rowers is concentrated in the regular rhythmical sweep of the oars. The attentiveness and self-absorption of children in many plays is remarkable. Players in games involving a decided vaso-motor reaction are characterized by an energetic whole-souled attitude. They enter into the spirit of the game and play for all they are worth. The college grind in later life often lacks this whole-souled enthusiasm and energy of the athlete which has been imbibed in a healthy atmosphere of college sport. Concentration of energy and attention in a greater or less degree is a characteristic of the pure play reaction and by proper means these habits of energetic intensity and enthusiasm formed upon the play ground and football gridiron should be attached to the more serious objects of life. They are often formed in childhood only to be rarely utilized in after life.

4. Greater stimulation to growth and development. Mention was made of the fact that an activity of cells, either muscular or neural, brought to them a blood supply proportionate to the activity, and that this resulted in an increase of their size and power; also that muscular activity is really neuro-muscular and hence any muscular exercise would develop the muscular and neural centres involved, but that play with its general rather than local vaso-motor reaction and consequent nutritive supply would cause a general rather than local development. The bones and supporting tissues would grow and the visceral organs kept in a healthy state of functioning. The relation of this factor to the growth and development of the nervous system remains to be discussed.

The development of different parts of the cerebro-spinal system and of the different cells in the same part occurs at different times during fœtal and child life. This development of the neuroblasts consists (1) of an increase in size, in the formation of abundant cytoplasm and outgrowths and in chemical modifications. These outgrowths consist of many dendrons and dendrites and an axone with its collaterals, which are the means of establishing functional connections with the end organs and various central cells. It is probable that no functional activity occurs until there has been quite a development. The generally accepted law is that functional activity is coincident with medullation of the axone. Progressive medullation has been traced. It begins in the fifth week of fœtal life and continues to the thirty-fifth and fortieth year. The first to mature are those which are fundamental and racially the oldest, and the order of development proceeds from these to those of more recent evolution. This order seems to be of hereditary necessity and has been termed the law of "Fundamental and Accessory Development." Ross (2) in his Diseases of the Nervous System, and Hughlings Jackson in his "Three Level Theory," (3) developed the basis of the law, and the pedagog-

(1) Donaldson, op. cit., p. 163.
(2) Ross, Diseases of the Nervous System, pp. 83-89. Lea Bros., 1885.
(3) Hughlings Jackson, Some Remarks on the Evolution and Dissolution of the Nervous System, Journal of Mental Science, April, 1887.

ical application has been made by Burk (1) that education must follow this nervous development, while Hartwell first applied the law to the pedagogy of physical training. Burk and Hartwell both well describe the bad results following the non-observance of this law. "The result of this inverted and unnatural order of teaching is seen in myriad forms of nervous disease, which find expression in St. Vitus dance, grimaces, spasms, convulsions and other forms of disordered muscular action, as well as in protean forms of headache, nervous exhaustion and mental derangement so common nowadays amongst sedentary people and brain workers." (2) After these neurones have become medullated and functionally active their development does not stop. The process continues, they becoming larger, more powerful, and with more numerous connections. This is the nascent period, the period of plastic growth and of education. (3) But this upward sweep of progressive medullation does not embrace all neuroblasts as it goes. Many are not included even in the spinal cord and may develop later, while a large number in the form of granules never develop at all.

In considering the effect of use and exercise upon this nervous development three sets of facts must be kept in mind.

a. There is a regular order of development of a number of neurones up to birth and possibly later, which at least includes the process of medullation, and which seems to depend upon hereditary necessity and is therefore relatively independent of use and exercise. These are the fundamental centres and they form a sort of skeleton around and from which further growth occurs.

b. After birth each medullated neurone has a nascent period of growth and development in size, strength and complexity, and it is upon the quality of this that the development of higher centres is dependent. This development of the fundamental centres during their nascent period depends upon use or exercise and consequent amount and quality of nutrition. Hence the argument is valid that education must proceed from the fundamental to the accessory or higher centres. Free play, if founded upon the surplus energy theory, would follow these lines of growth and development, and hence obey this law, while work would not of necessity do so.

c. The development of the neuroblasts around this frame work of fundamental centres is continually occurring. These represent the accessory movements; they are the so-called higher centres whose full and complete development is dependent upon that of the more fundamental ones.

Kaiser found that the number of developed neurones in the cervical enlargement in man more than doubled from birth to the fifteenth year (4)—accessory centres. The causes and the order of their development are not definitely known though, as in all growth, nutrition or blood supply is a large factor. (5) But their blood supply can hardly depend upon exercise because

(1) Burk, Ped Sem., Vol. VI., No. 1. 1898.
(2) Hartwell, *op. cit.*, p. 21.
(3) Burk, Ped. Sem., Vol. VI., No. 1, p. 21.
(4) Donaldson, *op. cit.*, p. 164.
(5) Burk, Ped. Sem., Vol. VI., No. 1, p. 9. Quoted from Vulpius.

they are not yet supposed to function. The experiments of Ambronn and Held (1) demonstrated that in the optic nerve of a kitten rapid medullation depended upon the stimulation of light, though it is probable that here the increased blood supply was the important factor. But in this case undoubtedly the neuroblast had already attained a considerable development, the axone extending to the end organ and hence being subject to stimuli. But with neuroblasts and granules the case is different; they have not developed their connections as to be in functional contiguity to stimuli, although there is some doubt on the question. (2) Yet their growth does seem to bear a relation to exercise of the organs concerned.

The number of axones running to the arm for instance increases with age and varies with individuals. Flechsig found the number running to the right hand 50 per cent. greater than to the left hand. (3) These represent the finer and more delicate movements of the right member. Hartwell states that exercise increases the number of neurones as well as their size and elaboration of parts. (4) The education of imbeciles and idiots through exercise proceeds upon this assumption. Large parts of their nervous system are yet undeveloped, the elements being in their granular state and upon which sensory stimuli seem to make no impression. Yet they are successfully reached through muscular exercise as is evidenced by the success of this mode of treatment in the past twenty years. (5) Mosso argues at length that muscular reactions of the finer and more delicate sort develop the centres for higher psychic life, that mobility of the extremities and intelligence are coincident throughout the animal world. (6) Cunningham from studies of the brain of man has reached the conclusion that recent evolution has been in the frontal-parietal operculum of the left Rolandic area covering the Island of Reil. This region governs the finer and more delicate movements of the right arm and hand, facial expression and speech, and Cunningham attributes this evolution especially to the acquirement of speech. (7) An objection to this might be offered that there has first been variations in size of the brain centre and that this has allowed of the acquisition of these finer muscular coordinations, but when we remember that the possibility of development in any brain centre has never been realized, Cunningham's explanation seems the more probable.

Thus it seems plausible that the granules are not susceptible to direct stimulation, but that they are developed into functional activity at least by reactions in adjacent neurones, and that this is accomplished through a decisive and somewhat diffused blood supply due to local reactions embracing adjacent granules. This is borne out by a statement of Donald-

(1) Mosso, Clark University Decennial Celebration Publication, p. 384.
(2) Donaldson, *op. cit.*, p. 231. From His.
(3) Hartwell, *op. cit.*, p. 12.
(4) Ibid, p. 9.
(5) See Elmira Reports, Writings of Seguin, Wey, et al.
(6) Mosso, *op. cit.*, p. 390.
(7) Cunningham, Presidential Address Before the Anthropological Section of the British Science Association. Science, Oct. 18 and 25, 1901.

son's (1) that hyperaemia caused an increase in the size of a rabbit's ear, and by the somewhat metaphorical language of Dr. J. Crichton Browne: "Even in the full grown brain small round cells of the embryonic type are still abundant, and suggest the possibility of further educational development. Of the superficial area of every brain there is only a certain proportion that is under cultivation. Education is directed not only towards securing the best possible returns from the districts that have been brought under cultivation, but also towards encroaching on the waste territories, and compelling them to become fruitful of thought. *But the waste territories can only be approached from those that are already tilled.* Education must eat in upon their margins, and this it probably does by putting forth new branches from already cultivated cells." (2) Flechsig states that medullated paths gradually grow out from the sense centres into the non-medullated regions, (3) i. e., the course of functional development proceeds from the active functioning centres to the non-active and immature ones. Hence exercise of the fundamental centres would tend to develop the accessory, and play with its more intensive vaso-motor reactions and its tendency to variability (4) would be much more effective for this purpose. The probable conclusion would be that free play, since it obeys the law of "The Fundamental to the Accessory," involves a more vigorous and extended blood reaction, possesses a great variability of reaction, and can be either predominantly neural or muscular, would secure the fullest, most complete and symmetrical development of the nervous system possible. (5)

5. Variability of the play reaction. In work there is a definite, precise and regulated reaction adapted to a definite end. A normal amount of energy is released along definite channels and to definite centres. When work becomes habitual as it usually does, this energy is discharged along habitual associations,—along lines of least resistance. A central cell is connected by its axone, which has a number of branches and collaterals, with a number of other cells. Each of these again may have a number of connections with peripheral cells. So a discharge from a single cortical cell has many possible channels to the periphery. A habit would be a tendency

(1) Donaldson, *op. cit.*, p. 39.
(2) J. Crichton Browne, *op. cit.*, pp. 286-7.
(3) Barker, The Nervous System, p. 1073. Appleton & Co., 1899.
(4) See following section on the variability of the play reaction.
(5) Hall and Allin (Psychology of Tickling, Laughter and the Comic, Amer. J. of Psychology, Vol. IX) suggest that a complete theory of play must not only include exercise of congenital tendencies in order that they may become *useful* (theory of Groos) but also embrace exercise of faculties in order that they may become *useless*, but whose disappearance is a necessary pre-condition to the development of some higher and more useful function. It is the well known tadpole analogy. Prof. Allin suggests the term "metamorphic stimulation" for such phenomena. He also suggests that preliminary stages of development, such as "the wild oats' period," the delight in myths, legends, etc., nurse within them qualities of mind and action which are matricidal in nature, in that they are turned back, so to speak, in destructive criticism of some of the features of the early stages. The same truth applies also to political and social development. See also G. S. Hall, Some Social Aspects of Education, Ped. Sem., Vol. IX.

for this discharge to invariably follow definite channels because of the lessened resistance due to repetition. When there is a heavy discharge, it may be sufficient to overcome the resistance in other of the possible avenues, thus bringing in subordinate reactions. This is the case in epilepsy, where very unstable cells under strong stimuli discharge and, spreading down to the periphery, involve, instead of regulated, precise and coordinated movements, many unregulated, uncoordinated reactions of the musculature, glands and vaso-motor centres. Intensive and vigorous movements have this character, embracing many unregulated and subsidiary reactions, and lacking the element of precision. In intense passion with a hyperaemic condition of the brain and musculature, the individual loses control of himself and there is a raging flux of ideas and hundreds of unregulated, spasmodic movements of the muscles. Hyperæmia of the brain is accompanied by a flow of ideas, of new associations. (1) Many brilliant inventive writers have unconsciously adopted devices to secure this hyperaemia of the brain without which they are unable to do their best work. Lombroso mentions many such devices as wine, reclining prostrate with the head lower, near the fire, or covered up with pillows. (2) "From the physiological side, that which rouses an interest tends to quicken the pulse and determine a full blood supply to the entire central system, yet the narrow gymnastics of the school, in the most austere form, do not in themselves produce that condition of good nutrition favoring the best diffusion of the impulses and the formation of secondary and subconscious associations." (3) Play with its discharge of surplus energy, above the regular normal amount, and its quickened vaso-motor reaction, would tend to cause irregularity of reaction. (4) Originating in instinctive or habitual associations they would involve also new lines of discharge, new associations, variations from our instinctive or habitual reactions.

Myths, legends and fairy stories have a recognized value for young children and have been widely introduced into the elementary curriculum because they cultivate the imagination and fancy. Stories of adventure, fiction and poetry are good for the same reason. Pure speculative metaphysics has been successfully introduced into the high schools. It possesses the value of initiating habits of mental curiosity, speculation and hypothesis. There may be some useful thought content to these activities but their common as well as their psychological justification is their cultural value, initiating habits of mental reaction which later are useful. All these are really plays, plays among ideas, among neural associations. Imagination and fancy are not entities, but like speculation and hypothesis are types of mental reactions which on their neural side are associations varying from

(1) J. Crichton Browne, *op. cit.*, p. 290.
(2) Lombroso, The Man of Genius, p. 22. Scribners, 1896.
(3) Donaldson, *op. cit.*, p. 356.
(4) Compare with Baldwin's three ideas of increased vitality, pleasure and motor excess, in the explanation of adaptations. The use of this variability in securing an excess of ideas or muscular reactions and thus multiplying the chances of successful adaptation to new circumstances in life is identical with Baldwin's conception. Baldwin, Mental Development, Chap. VI.

the ordinary. Cultivating the habit of fancy and speculation is cultivating the tendency to variability in neural associations and it is this which is of cultural value. It is commonly thought that the scientist has no imagination, but on the contrary, the best scientist has the best imagination. The use of the hypothesis is absolutely essential in inductive reasoning. A few facts are discovered; what are their significance? A fertile imagination supplies hypothesis after hypothesis. These form the starting point for a deductive search for new facts. Hypotheses are rejected and altered, new facts are discovered, and a new principle is enunciated. The imaginative and speculative type of mind whose theories are convictions, rather than means or working hypotheses is a failure. But habits of imagination united with a practical turn which tests speculations by an appeal to facts, give the highest type of the scientific mind—the scientific genius. "Darwin was as productive of hypotheses as Nature is of living things" and in fact could not resist forming one on every subject, but with one exception every first-formed hypothesis had after a time to be given up or greatly modified. (1)

"There is nothing new under the sun," is an old aphorism which contains much truth. Our knowledge consists of combined sensations. Elemental facts and perceptions are for the most part the same for all. New knowledge is largely a recombination of the old, new associations of elemental facts. Darwin viewed the same world as his predecessors, but he viewed it in a new light, associated the facts in a new way. Many explanations of the genius have been offered, some comparing them with the insane and some with the child. (2) They have at least this in common that they are extremely variable, they are continually associating things in new ways, not content with accepting existing explanations. "Childhood, like greatness, is never exact." (3) The genius varies from social habits in neural associational activity, is continually forming new associations, new hypotheses, at last finding one which is better suited to existing facts and conditions. (4)

The variability of the play reaction in securing an excess of ideas and reactions has been of importance in biological and sociological evolution. Groos well says that the spirit of rivalry and opposition has been a mainspring of advance in culture and quotes Sully that the best children from a biological standpoint are those who have "most of the rebel in them," possessing not a sulky but a playful, mischievous disobedience, (5) which means that they are the amenable non-conformers to the habitual, the variable, the adaptive, the progressive individuals. At one time variations were entirely organic, fixed and definite, but when evolution took the line of an increase of nervous plasticity, accommodations became more and more habitual, a result of experience and education. With the formal education of today

(1) Cramer, The Method of Darwin, pp. 37, 40. McClurg, 1896.
(2) Lombroso, *op. cit.*
Chamberlain, *op. cit.*, Chap. 3.
(3) Eby, The Reconstruction of the Kindergarten. Ped. Sem., Vol. 9, p. 55.
(4) Baldwin, Social and Ethical Interpretations, Chap. 5. McMillans, 1897.
(5) Groos, The Play of Man, p. 187.
Baldwin, Social and Ethical Interpretations, p. 117.

definite adaptations to existing conditions can be consciously impressed upon the young, but with animals and early man such was not the case. Each individual was left to make adaptations to existing and changing conditions as best they might. This was not done consciously, but was more or less a matter of chance, of circumstances. This is well illustrated from instances of animal psychology. "I noticed that one of my seven-days-old chicks pecked repeatedly at something near the corner of the turned-up newspaper which formed the wall of the enclosure, the paper being propped against a more solid support. The speck which had caught Blackie's keen eye turned out to be the number of the page. He then transferred his attention to the corner of the paper, which he could just reach. Seizing this he pulled at it, bending the paper down, and thus formed a breach through which he escaped into the wider field of my study. I caught and put him back near the same spot. He went at once to the corner, pulled it down and escaped, but was captured, and set down on the other side of the pen. Presently, he sauntered round to the old spot, reached up to the corner of the newspaper, pulled it down, and again effected his escape. A single chance experience had sufficed to teach him, and the association held good. Morgan (1) and Thorndyke (2) give other similar instances, embracing both observation and experiment, illustrating the acquirement of new adaptations. It is the "sense-trial and error" method. Lindley in a "Study of Puzzles" demonstrated that most of a child's reactions were of this nature. (3) A great many trials are made, and finally one of a thousand perhaps *happens* to be successful, and that amount of progress is a result. This is comparable with the methods said to be used by Edison, desirous of obtaining a new chemical reaction. The substance to be analyzed is placed in a long row of test tubes and all the different chemical reagents are poured into these tubes, until one happens to be successful. In the early stages of animal evolution when adaptations were becoming acquired rather than congenital, play in youth would graft upon instincts numbers of modifications which later in life would possibly secure better adjustment to external conditions. "The more adaptive activities must be given ere they can be selected from among those which are less adaptive.

"Herein, then, lies the utility of the restlessness, the exuberant activity, the varied playfulness, the prying curiosity, the inquisitiveness, the meddlesome mischievousness, the vigorous and healthy experimentalism of the young. These afford the raw material upon which intelligence exercises its power of selection. Observers of human life have not failed to contrast this youthful expansiveness ready to try all, dare all, and to do all, with the narrower and more restricted, if more concentrated efforts of those in whom the stern lessons of experience have checked so much that is picturesquely impossible. And this exuberant expansiveness of the young is a biological and psychological fact of profound significance." (4) So with early man

(1) Lloyd Morgan, Habit and Instinct, p. 153. Arnold, 1896.
(2) Morgan, Animal Behavior, pp. 134-155. Arnold, 1900.
Thorndyke, Psychological Review, June, 1898.
(3) Lindley, A Study of Puzzles. Amer. J. of Psych., Vol. 8, No. 4.
(4) Morgan, Habit and Instinct, p. 163.

play would secure a general variability of reaction, a greater possibility of successful adaptation to existing and changing conditions. Play has thus a biological and sociological value as a means of progress in acquired adaptations.

The case is not different in formal education, a conscious training of the young for life conditions. The apprentice system was a specialized training for particular ends, but with changing conditions their training was of no value, and they were unfitted to compete in their new environment. The apprentice system, like the old instinctive adaptations to the environment, made no allowance for continual progress and hence was a failure. Habits can be made almost as fixed and definite and precise as instincts and such are excellent amidst a static environment, but the conditions of life are constantly changing in every department of activity. The same habits and methods of work which brought success in professional or business activities a few decades ago would now be failures. The environment is being practically revolutionized every few decades, and we see many trained to definite and fixed habits and methods a half century ago, apparently unwilling, but really unable to adapt themselves to present day conditions. Work in education tends to definiteness, precision and fixity of habitual reactions; the steady, sober, industrious, and plodding youth often lacks the power of originality and self-initiative, the quick adaptability to suddenly and successfully meet new conditions, and loses in the race of life.

Morgan (1) justly objects to the application of the term "variation" to any acquired modification, suggesting the term "adaptations." The "grafting on" of adaptations to instincts and hereditary impulses treated in the section on the formation of instinct-habits might thus be confounded with the variability of the play reaction, inasmuch as this new habit is an addition or change from the pure instinct. But the new accommodation may be almost as definite and precise as the old instinct. The essential of the play activity is not in securing a definite accommodation as such, but in securing a *tendency to general variability* in instinctive and habitual reactions.

The same is true in imitation. It can be definite and precise—"slavish imitation," rather than spontaneous and variable. Perfunctory copying may have its uses in education, but it certainly robs the child of all self-expression and originality. Baldwin well shows the utility of the variability of the imitative reaction in the development of spontaneity, self-activity, and originality. (2) Eby strongly indicts the artificiality, unnaturalness and mechanizing spirit of the kindergarten because it allows no room for variability, originality and self-expression. (3)

Definite and fixed habits and adaptations have their use and both play and work secure these, but the essence of the play spirit is its *variability of reaction*. It tends to inculcate, not a definite adaptation, but a habit of general variability, an elasticity of body and mind, a general adaptability, spontaneity, originality and inventiveness to successfully and quickly meet

(1) Morgan, Habit and Instinct, p. 233.
(2) Baldwin, Mental Development, Chap. III.
(3) Eby, *op. cit.*, p. 51.

new requirements and conditions of life. It is the cultural rather than the specializing phase of education.

V. PLAY IN EDUCATION.

With this understanding of the essential values of the play reaction, we are in a position to depict its uses and limitations in educational philosophy and practice. The first four values, the ease, amount and intensity of the reaction and its greater developmental value are qualities which are highly desirable and which would seem to lead to its almost universal adoption as an educative reaction. The fifth, its variability, is a peculiar quality of neuronal functioning which certainly possesses utility, but whose amount and province must be determined by social needs.

In assigning a province to play in educational practice the mental character of much play cannot be too strongly emphasized. There is no sharp distinction between motor and mental plays as both elements in varying degrees are found in every play activity. The motor element predominates in a large number but the mental element is increasingly marked in the imitative, dramatic and imaginative types. Even where the motor element is not noticeable there may be spontaneous mental reactions as revery, day-dreams, etc., entirely unknown to the observer which are just as truly plays as spontaneous movements. The motor plays are more obvious and their utility more unquestioned, while idleness is generally assumed in case of an extreme mental play and its physical value not understood. Play is as much a part of *formal* education as it is of physical training.

A priori we should expect fro mthese facts that the play reaction has had a large province in education. A history of education in its largest sense tracing the development and province of the play and work reactions is a task for the future. Even a cursory review is almost out of the question, inasmuch as the difference between the two reactions is largely one of spirit rather than of objective characteristics. The following is intended to be tentative and suggestive rather than conclusive and dogmatic.

Among animals and primitive men there is but little doubt that play was the main educative factor. Imitation is always present to a large extent but it may be of either the play or work character. The reactions resulting from commands, injunctions and prohibitions possess the work characteristics and without doubt were present in primitive times. However, among early societies the spontaneous plays, play in imitation of all adult activities, in imitation of animals, the dramatic dances, the myths, stories, legends, sagas, epics, rites and ceremonies were the main means of educating the young into the social fabric, and undoubtedly these activities were of the play nature. Play was certainly the natural and primary educational reaction.

The work spirit in the education of the young, which is so prevalent in present day formal instruction, was an artificial and secondary reaction which was introduced in response to new ideals and social needs. In considering the matter from a theoretical and historical standpoint, it would

seem that it is rather the work reaction which needs to be justified in educational practice.

Among the oriental theocratic nations which had acquired some degree of cohesion and solidarity, formal instruction appears and it is of a work nature. The Chinese, Hindoo, Persian and Egyptian instruction is formal, dogmatic and rigid in spirit to a great extent. It is dull, dry and monotonous with little appeal to the imagination, interest and spontaneity of the child. The attempt is made to force and fit the child into rigid social molds. The needs and demands of society occupy the educational consciousness; the needs and demands of the child are not considered.

The same spirit largely dominated the formal and conscious education among the Greeks and Romans and it was greatly accentuated in mediæval and modern times by the spirit of asceticism, monasticism and puritanism.

The play spirit was not crushed out entirely; it was largely eliminated from mental reactions but in bodily training the play reaction was largely retained. Where definite and precise motor reactions were required the work spirit has been introduced, e. g., in the apprentice system, training for trades and occupations, and to some extent in the military training of the Spartan youth. But for general cultural value the physical training of the young has been accomplished by the natural spontaneous reactions, until the attempt was made on the continent during the last century to subject the youth to the rigid formalistic exercises of the various systems of gymnastics. (1)

Thus the entire education of the child has been differentiated into two parts: 1st, a period of formal instruction from which the play reaction has been eliminated, and 2nd, a period given up to the child for its natural and spontaneous educational reactions. This system is yet retained and we have our resulting maxim "there is a time for work and a time for play."

As a result of this division we have our popular conceptions of play and work. To the adult mind formal instruction has its recognized utility and it is regarded as a real serious business-like affair. There is no pretence, sham or self-illusion in it; it is one of the serious things of life. The other period of play, of spontaneous activity, has not been seriously regarded by the popular mind. Its real utility in education has not been truly comprehended. It is regarded as a sort of idle pastime, a recreation which is probably necessary, but which has no real value in preparing the child for active adult life. It is not regarded in a real, serious, business-like way. This popular social judgment is impressed upon children as their own, and is used (or rather misused) in adult interpretations of a child's psychic experience during play. As a result we have the opposing theories as to the self-illusion or reality of play as a subjective phenomenon in children. (2)

Psychologically those conscious states are real and serious which persist and are fixed in consciousness. Illusions possess a transitory nature. An adult's daily activities are thus real and serious to him. A modern business

(1) Physical Training, Chap. XIII., Rep. Comm. Ed., 1891-2.
(2) Groos, Play of Man.

man would look upon the elaborate rites, ceremonials and dances of a primitive community much as he regards the traditional games of a civilized youth. To the primitive man his rites and ceremonials are real and serious things, while the activities of a business man, the Episcopalian ritual or the drills and ceremonies of a fraternal order, must seem nonsensical, full of pretence and sham. We give value to those things which engross our time and attention. So with children, their plays are real and earnest matters, but as they grow older in life and experience and their interests and activities keep changing, they continually view the activities of preceding stages with amusement, wondering how they ever regarded them as of serious moment. Women fully engrossed in the routine of making calls, many clubs and societies, regard the doll play of little girls with sympathetic amusement, but from the standpoint of real utility the little tots are hardly at a disadvantage. Did not society impose upon children their own distinction between tasks demanded and the activities spontaneously undertaken, children would still notice the difference between them but probably regard their own as the ones of serious moment.

As society recognizes that these activities are of real and serious moment to the children and that they have as great an educational value as the tasks of formal education, the popular distinction between work and play must vanish. As Fenelon pointed out, the common way of placing everything that is disagreeable on one side, and everything that is pleasant on the other, connecting the former with industry and regarding the latter as idleness and waste of time, can hardly be commended to call out the very best in a child's nature.

In later times the trend of educational practice has been away from this sharpcut two-fold division. The play spirit is being introduced into formal education, while direction, encouragement and supervision are extended over the old time play period. We are tending to combination and integration rather than to separation and differentiation.

Fenelon in the latter part of the 17th century was one of the first to recoil against the rigid formalistic education and to advocate the introduction of the play element by appealing to the interests and inclinations of the pupils. He saw no reason why education should not become a pastime as enjoyable and spontaneous as the child's own dramatic activities. Rosseau, Pestalozzi and Froebel emphasized the same idea in varying ways and degrees. The movement has been checked at times, but on the whole has steadily grown in force and volume. The kindergarten is the outgrowth of this idea and at present the play spirit is very prevalent in the lower grades. The movement has been further accentuated by the growth of child study, the new psychology, and the efforts of a host of educational specialists in the universities. The extension of the play spirit into the upper grades and the high schools is earnestly advocated and just as earnestly resisted by a large number of conservative educators. The play and work reactions in

formal education are in the main represented by two opposing schools of educational philosophy and practice—the psychological and the logical. (1)

The child is the keynote of the former system carried to its far extreme. Educational reactions are adapted to the child, its interests, tendencies, whims and desires. The child is the master and the educational system is his servant. The word work is banished from his vocabulary. Everything is made interesting, his spontaneity and self-initiative are encouraged and he travels the educational path freely, spontaneously and of his own accord.

The sociological school in its extreme typifies the work reaction. The social end of education stands out preeminent in consciousness. The child is to be adapted to a definite, precise and complex order of social relationships. Here reign order and stability entailing regularity and precision of conduct. Here are rules of conduct in social relationship, in business, in public and private morality, and in the industrial regime which must not be violated. Here are customs, ideals, beliefs, modes of thinking and systematized bodies of thought which are prescribed. The child is formed and straight-jacketed to fit an existing and prescribed standard, no matter what his interests and tastes may be. In the former case the educational reactions are adapted to the child, but in the latter they are adapted to an objective standard—the social demands of the age. They are the play and the work reactions.

These ideas represent the theories of the two schools carried to a logical extreme while in fact there is little difference between them in actual practice. They merely call attention to and overemphasize their own standpoint, taking for granted or overlooking the obvious truths on the other side.

The claims of the sociological school are certainly reasonable and sensible, and no one can dispute them. An accountant must be trained with mechanical habits of accuracy, regularity and precision in many business details. Mistakes impair his usefulness. Precise and accurate habits of speech are demanded of all. Society demands certain definite, regular and unerring habits in private and public life and social intercourse. Unquestioned obedience to many social and moral laws is demanded. Our penal institutions are designed to take care of those with too erratic habits. The industrial regime demands certainty and regularity of action. In fact the cohesion and organization of society into a great social, political and industrial machine has depended upon the inculcation of certain definite, regular and unerring habits of reaction. Without them specialization and division of labor would be impossible. The individual is a unit in a great interacting, interdependent aggregation and his success is dependent upon the unerring regularity and precision with which the tasks of others are performed. Each must depend upon the other units reacting regularly in certain definite and prescribed ways. The efficiency of the whole depends upon the mechanical behavior of the parts.

The machine-like qualities of the work reaction has thus been and will continue to be a necessary and integral part of education. From it are born

(1) Allin, A Criterion in Educational Processes. School and Home Education, Jan., 1900.

law, order, efficiency, organization and responsibility—the stable and conservative qualities of society. These are necessary, but are also detrimental when carried to an extreme. No allowance is made for variability of reaction, for growth and progress. (1) It is the old story of instinct and variation, of definite unerring habits and an irregularity of reaction which admits of accommodation. The qualities of the play and work reactions are *both* demanded as ends of education but the *amount* (2) of each element will be determined as heretofore by social selection.

If these two qualities of regularity and variability in varying amount are demanded as ends, what valid reason is there for the present tendency of mixing the two types of reaction promiscuously in the educational process rather than the old two-fold division with a period of work and a period of play? A due proportion of the two might be secured by either method. The answer must be sought in the first four special utilities of play (3) and in the composite nature of a work or play activity.

Any activity is a composite of many reactions either of a work or play nature. Psychologically the activity is a unit and is either work or play, according to the predominant state of consciousness. Hence we may have an educational activity which possesses the four special utilities of play and yet which might secure to a large degree the educational results of a work reaction.

It must not be thought that the resulting conscious state varies directly to the ratio between the number of play and work reactions in the activity. For instance, if an activity is composed of twelve work reactions and ten play reactions, the work elements do not necessarily dominate in consciousness. The matter is complicated by the strength of the resulting afferent stimuli of each reaction, by suggestion, imagination and attention. Theoretically the activity may be largely composed of work reactions and still be regarded as play. Mark Twain's story of Tom Sawyer and the fence is a case in point and instances may be multiplied. Herein lies the absurdity of our present concepts of work and play with their associated emotional reactions. It would be better to make the child believe his school tasks were play than to have them regarded as work and drudgery.

The large percentage of work reactions entering into a spontaneous play activity may be seen in group games, dramatic, imitative and traditional forms of play. Precision and definiteness are largely demanded. It is said that on certain occasions among the Kwahiutl Indians of British Columbia the dancer who makes a mistake is killed. (4) Play does not necessarily mean anarchy; there may be rigid, monarchistic organization and still play. Buecher (5) shows that primitive man gradually acquired habits of work,

(1) Chap. IV., Sec. 5, *supra*.
(2) The amount of each element cannot be fixed in any definite ratio, since it will vary not only with changing conditions of society, but for the different occupations of life. A poet and a scientist would demand a different proportion.
(3) Chap. IV., secs. 1-4, *supra*.
(4) Wallaschek, *op. cit.*, p. 276.
(5) Buecher, *op. cit.*

sewing. constructive work, etc. (1), the introduction of various systems of self-government (2), or gymnastics, military training, rigid supervision and encouragement of football, baseball and track athletics is evidence of the fact that the authorities are becoming aware of this phase of education in its positive aspects, and that in the future the proper organization and direction of the pupils' outside activities towards educational and social ends will demand an equal share of the authorities' time, energy and attention. (3)

Much remains to be accomplished, but there is no doubt that the tendency is away from the two fold division, and toward an integration of the pupil's entire activities as a whole; an introduction of the play spirit into formal education and much of the work spirit into the play period. How far this process shall continue and still subserve educational ends, whether our present distinction between work and play shall vanish, whether all the child's activities shall be systematized as one whole where everything is real and serious without destroying the ratio of variability and definiteness of reaction prescribed by society, is a question to be worked out in the future by patient trial and effort.

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(1) Vacation schools or public play grounds under the supervision of the school authorities have been established in Boston, New York, Chicago, Cambridge, Cleveland, Brooklyn, Philadelphia, Indianapolis, New Haven, and in various continental cities. The idea has been mainly to direct the spontaneous activities of the children of the crowded tenement quarters, which were liable to develop into vicious and mischievous anti-social tendencies, into healthful social and educational lines. For a more detailed account the reader is referred to the following references:

Public Play Grounds and Vacation Schools, Chap. XV., Rep. of U. S. Com. of Educ., 1899-00.

Chicago Vacation Schools, Amer. J. of Soc., Vol. IV.

Movement for Small Play Grounds, Amer. J. of Soc., Vol. IV.

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(2) Johnson, Rudimentary Society Among Boys, John Hopkins' Univ. Studies, Nov. 1884.

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Shaw, The School City—A Method of Self-Government. Rev. Rev., Dec., 1899.

(3) As an instance of what may be done in this positive direction the reader is referred to the excellent article "An Educational Object Lesson," by Sanford Bell in the Ped. Sem., Vol. IX., No. 2. The article describes the work carried on in one of the ward schools of Washington, D. C.

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A Statistical Study of Education in the West.

CONTENTS.

A STATISTICAL STUDY OF EDUCATION IN THE WEST.

The preeminence of the East in matters educational is one of the popular conceptions of the day; culture and higher education have generally been assigned to her exclusive possession. Indeed this assumption is but natural when we recall the density of population and the wealth of this section with a school system long and firmly established. The West, on the other hand, is but newly and sparsely settled and both opportunity for and interest in educational advance would naturally be regarded at a minimum. However. the average visitor to this western section is often astonished at the relative position of the West in educational matters, but even he as well as those reared and educated within her boundaries and who are intimately acquainted with her educational progress fail to thoroughly appreciate her remarkable position, so firmly does current thought dominate one's judgment. The West still continues to send a relatively large proportion of her youth to Eastern schools because of her supposed lack of educational facilities.

The following is a study of the relative condition of education in the different sections of the United States based upon the statistics published in the Reports of the U. S. Commissioner of Education. The sections referred to are the divisions used by the U. S. Census Bureau and adopted by the Commissioner of Education: 1. North Atlantic Division, embracing the six New England States, New York, Pennsylvania and New Jersey; 2, South Atlantic Division, consisting of the eight states of Delaware, Maryland, Virginia, West Virginia, the Carolinas, Georgia and Florida, and the District of Columbia; 3, South Central Division, embracing the seven states of Kentucky, Tennessee, Alabama, Mississippi, Louisiana, Texas, Arkansas and the territory of Oklahoma; 4, North Central Division, embracing the twelve states of Ohio, Indiana, Illinois, Michigan, Wisconsin, Minnesota, Iowa, Missouri, the Dakotas, Nebraska and Kansas; and 5, the Western Division, of the nine states of Montana, Wyoming, Colorado, Utah, Nevada, Idaho, Washington, Oregon, California, and the two territories of New Mexico and Arizona.

This last division is the largest in point of size, being somewhat over 1,000,000 square miles in area and embracing the semi-arid plains of Montana. Wyoming, Colorado, New Mexico and Arizona, and the rugged mountainous country of the Rockies. In density of population it is far below the average as may be seen from the following table:

Table I. Approximate Population Per Square Mile.

Year.	N. A.-Rank.	S. A.-Rank.	S. C.-Rank.	N. C.-Rank.	West.-Rank.
1870......	73. —1	21.8—2	11.1—4	17.5—3	.9—5
1880......	89. —1	28.4—2	15.4—4	23.4—3	1.7—5
1890......	107. —1	33. —2	19. —4	30. —3	3.0—5
1900......	130. —1	40. —2	23.6—4	35.2—3	3.5—5

While the West has made the largest percentage of gain, yet a country of 1,000,000 square miles which boasts of but 3½ people per square mile can not be expected to compare favorably with a section containing six times as many people settled on one-sixth the area.

Nor can it be said that the population in the West is centred in the fertile spots, for with a few exceptions there are no great centres of population, it being fairly well distributed throughout the mountains and on the plains. The distribution of people many miles from a railroad where visible means of support are scant is a fact that forcibly strikes the attention of the observing visitor. But 35 per cent. of the total population of the West is gathered in centres of 4,000 or more, while 55 is the corresponding per cent. for the North Atlantic Division, as may be seen from Table II. This leaves 65 per cent. and 45 per cent. respectively of the population which is scattered in places of less than 4,000 people.

Table II. Percentage of Population (1890) in Cities of

	N. A.-Rank.	S. A.-Rank.	S. C.-Rank.	N. C.-Rank.	West.-Rank.
8,000 or more..	51.81—1	16.03—4	10.45—5	25.91—3	29.99—2
4,000 or more..	55.14—1	17.55—4	12.20—5	30.19—3	34.44—2

Table III. Percentage of Children (5-18 yrs.) to Total Population.

Year.	N. A.-Rank.	S. A.-Rank.	S. C.-Rank.	N. C.-Rank.	West.-Rank.
1870......	28.30—4	33.02—2	33.92—1	32.40—3	25.57—5
1880......	26.87—4	32.24—2	33.13—1	30.63—3	25.13—5
1890......	25.39—4	34.04—2	34.76—1	29.33—3	24.33—5
Averages .	26.85—4	33.10—2	33.93—1	30.78—3	25.01—5

Table IV. Percentage of Adult Males to Children (5-18 yrs.).

Year.	N. A.-Rank.	S. A.-Rank.	S. C.-Rank.	N. C.-Rank.	West.-Rank.
1890......	114.4—2	66.8—4	65.9—5	94.6—3	156.7—1

Table V. Percentage of Population of Foreign Birth.

Year.	N. A.-Rank.	S. A.-Rank.	S. C.-Rank.	N. C.-Rank.	West.-Rank.
1890......	22.34—2	2.35—5	2.93—4	18.16—3	25.46—1

From the foregoing tables it will be seen that the proportion of children of school age to the total population is lower in the West than in any other division, there being three adult males for every two children. This means also undoubtedly a large per cent. of unmarried males. Inasmuch as the children occupy a relatively small place in the total population, it would naturally be inferred that their education would likewise tend to occupy a similar position in public interest, yet granted an interest in education equal to that of the East, this preponderance of taxpayers would of course be an item of material benefit. The percentage of foreigners is the largest in the West; this includes the Mexican element in the southern part, the Chinese, and the lower class of Europeans who are attracted to the mines, and it forms an element distinctly unfavorable to any high degree of interest in educational progress.

With this preliminary review of the unfavorable conditions in the West, one is in a position to better appreciate in their true significance the following series of facts bearing upon the enviable position of the West in education. The statistics dealing with the "common schools" refer to both the grades and secondary work of the public schools, (1) and cover the years in the life of a child from five to eighteen.

COMMON SCHOOL STATISTICS.

The table (VI) giving the percentage of the total population who are actually enrolled in the common schools, shows a remarkable increase since 1870 in the two southern divisions, a fair increase in the West, and a marked decrease in the East and North. The North Central, the South Central and

Table VI. Percentage of Total Population Actually Enrolled.

Year.	N. A.-Rank.	S. A.-Rank.	S. C.-Rank.	N. C.-Rank.	West.-Rank.
1870......	22.09—2	6.26—5	7.49—4	24.41—1	13.82—3
1880......	20.20—2	16.36—4	15.38—3	23.23—1	16.32—5
1890......	17.89—4	19.72—3	21.02—2	22.43—1	17.03—5
1900......	17.32—5	20.91—3	21.46—2	22.16—1	19.70—4
Averages.	19.38—2	13.31—5	16.34—4	23.06—1	16.72—3

the South Atlantic Divisions at present (1900) lead in the percentages, but their significance is negatived by the fact that the proportion of the children to the population is also greater in these sections, as may be seen from Table III. If a section has a relatively large number of children, a relatively large percentage of attendance would naturally be expected.

Table VII eliminates this factor; it gives the ratio of those actually enrolled in the public schools to those who ought to attend, and thus furnishes safe and interesting data to compare the interest taken in education in the different sections. As will be seen, there is a remarkable increase in the

Table VII. Percentage of the Total Number of Children (5-18) Actually Enrolled in the Public Schools.

Year.	N. A.-Rank.	S. A.-Rank.	S. C.-Rank.	N. C.-Rank.	West.-Rank.
1870......	77.95—1	30.51—5	34.17—4	78.87—2	54.77—3
1880......	75.17—2	50.74—4	46.43—5	75.84—1	64.96—3
1890......	70.45—2	59.22—5	60.14—4	76.46—1	70.01—3
1900......	68.09—3	61.37—5	61.90—4	75.68—2	81.13—1
Averages.	72.91—2	50.46—5	50.66—4	76.21—1	67.72—3

South and West and a decrease in the North and East. The West jumps from third place in 1870 to first in 1900, and at present out of every 100 chil-

(1) This leaves out of account the private schools. As they are probably more numerous in the East, this puts that division at a disadvantage in the following comparison. However, these private schools are included in all the statistics on secondary education in the succeeding chapter.

dren who ought to be in school, the uncultured West can boast of 81 who are enrolled, six more to the hundred than the North Central States, its nearest competitor, *and thirteen more to the hundred* than in the North Atlantic States, where there is supposed to be every incentive and opportunity for securing an education. The remarkable increase in the West in 1890-00 is also of note in spite of the hard times which materially decreased the revenue (see Table XVII). On the general average for the thirty years, the North, East and West stand in order, although this covers a period when there were but nine inhabitants to the ten square miles in the Western Division. It will be noticed also that, with the exception of the North Central Division, there is no fluctuation, but that present conditions in each section seem to be the result of a marked general tendency.

Table VIII. Average Number in Daily Attendance for Each 100 Enrolled.

Year.	N. A.-Rank.	S. A.-Rank.	S. C.-Rank.	N. C.-Rank.	West.-Rank.
1870......	58.7—4	59.4—3	67.7—1	58.4—5	65.8—2
1880......	62.3—4	62.5—3	65.8—1	60.8—5	65.5—2
1890......	65.5—1	63.9—3	63.8—4	63.6—5	64.5—2
1900......	72.4—1	61.0—5	66.8—4	69.8—2	68.1—3
Averages.	64.7—3	61.7—5	66.0—1	63.1—4	65.9—2

Table VIII is likewise of value for comparison of the interest taken in school work, by showing the comparative daily regularity of attendance of those enrolled and attending school. The North and East show a steady and regular increase in regularity of attendance, while the other three are fluctuating. The North Atlantic Division has made the greatest gain and at present stands first in point of attendance, with the North Central Division and the West close followers. The West stood second in this respect for 1870, 1880 and 1890, but dropped to third place in 1900. The positions for an average of the thirty years is, S. C., West, N. A., N. C. and S. A., a record very favorable to the West, considering that it covers a period when the country was very sparsely and newly settled. While Table VII indicates the interest in education in the community at large, this table should fairly indicate the interest of the enrolled pupils. Again attendance would be governed to some extent by the accessibility of the schools, which would naturally be expected of a low degree in a lately and sparsely settled community. The above table (VIII) should also be compared with No. VII. In the North Central Division there is a large per cent. of the children enrolled, bringing in many of desultory attendance. This would account for its relative low position in the present table. Likewise in the East the enrollment is steadily decreasing, thus coming to include those who would be most regular in attendance. Regularity of attendance and enrollment would tend to vary inversely. This is markedly so in the East, and to a certain degree in the North and South Central Divisions. In the South Atlantic and Western Divisions, in spite of a marked increase of the enrollment, the attendance has not decreased, but shown a slight increase in regularity, a fact which speaks well for the status of education.

Table IX. Average Number of Days of School Per Year.

Year.	N. A.-Rank.	S. A.-Rank.	S. C.-Rank.	N. C.-Rank.	West.-Rank.
1870	152.0—1	97.4—4	91.6—5	133.9—2	119.2—3
1880	159.2—1	92.4—4	79.2—5	139.8—2	129.2—3
1890	166.6—1	99.9—4	88.2—5	148.0—2	135.0—3
1900	177.1—1	112.0—4	99.7—5	155.6—2	145.7—3
Averages	163.7—1	100.4—4	89.7—5	144.3—2	132.3—3

Table IX gives the average length of the school year in the different divisions. Each keeps its relative position for the period as well as for the average, the North Atlantic, the North Central and the West coming in order, with nineteen days more school per year on an average to the credit of the East. All divisions show a steady and regular gain, though in this respect the West has the advantage. It has made the largest actual gain in the thirty years, beating the East by 1.4 days and the North Central Division by 5 days, while if given in per cent. the results would appear greater.

Table X. Average Number of Days Attended for Each Enrolled Pupil.

Year.	N. A.-Rank.	S. A.-Rank.	S. C.-Rank.	N. C.-Rank.	West.-Rank.
1890	109.0—1	62.2—4	56.2—5	94.1—2	87.2—3
1895	119.0—1	66.2—4	63.6—5	101.9—2	98.0—3
1900	128.3—1	68.3—4	66.6—5	108.7—2	99.2—3
Averages	118.8—1	65.6—4	62.1—5	101.6—2	94.8—3

Table X is really a combination of Tables VIII and IX, but for three different years. It can be readily seen that the average number of days in attendance would depend upon the regularity and the length of the school year. However, owing to a wider divergence, the length of the school year dominates the results of this table, and as can be seen, they are really identical with those of Table IX.

Table XI. Average Number of Days Schooling Given for Every Child.

Year.	N. A.-Rank.	S. A.-Rank.	S. C.-Rank.	N. C.-Rank.	West.-Rank.
1870	70.2—1	18.1—5	21.8—4	59.6—2	45.9—3
1880	74.5—1	29.3—4	24.2—5	64.4—2	54.9—3
1890	76.8—1	37.3—4	33.9—5	71.9—2	61.2—3
1900	87.5—1	41.9—4	41.2—5	82.2—2	80.5—3
Averages	77.1—1	31.6—4	30.3—5	70.0—2	60.6—3

The above table in presenting the length of the school year in relation to the actual number of children who should be in school again presents nothing new, it being a combination of Tables IX and III. The large percentage of children in relation to the population and the relatively short terms unite in making extremely low percentages for the South. The North Central Division suffers some in this respect, while the West, having the

least percentage of children, suffers least, making a somewhat better showing than in Table IX. On the whole, the figures with slight modifications duplicate former results. The same may also be affirmed of Table XII, which compounds the length of the school term with the total population.

Table XII. Average Number of Year's (200 Days) Schooling Given to Every Individual.

Year.	N. A.-Rank.	S. A.-Rank.	S. C.-Rank.	N. C.-Rank.	West.-Rank.
1870	4.43—1	0.80—4	0.78—5	3.71—2	2.77—3
1880	4.84—1	1.90—4	1.57—5	4.19—2	3.57—3
1890	4.99—1	2.42—4	2.20—5	4.67—2	3.98—3
1900	5.60—1	2.72—4	2.68—5	5.34—2	5.23—3
Averages.	4.96—1	1.96—4	1.81—5	4.48—2	3.89—3

Table XIII. Teachers Compared With Pupils, Buildings and Population.

Year.	N. A.-Rank.	S. A.-Rank.	S. C.-Rank.	N. C.-Rank.	West.-Rank.
1. Number of Teachers per Building—					
1890	1.9—1	1.2—4	1.2—5	1.7—2	1.6—3
1900	2.4—1	1.4—4	1.2—5	1.7—3	1.8—2
2. Enrolled Pupils per Teacher—					
1890	33.9—2	43.9—4	46.6—5	29.2—1	34.3—3
1895	34.7—3	43.1—4	47.1—5	31.0—1	33.3—2
1900	35.7—3	43.9—4	46.7—5	32.0—1	32.9—2
3. Population per Teacher—					
1890	190.2—2	223.0—5	221.7—4	132.9—1	201.7—3
1900	202.3—3	212.2—4	217.5—5	144.3—1	166.9—2

The number of teachers to a building is not a sure criterion by which to judge the excellence of a school system inasmuch as it may prove rather a certain localization of population, allowing of a number of grades in a building. However, this makes possible a greater amount of grading, and thus secures more efficient instruction. The low number proves the present existence of a great many of the district schools with but one teacher. It will be noticed that the North Atlantic, the South Atlantic and the West have made some progress in centralization, while the South and North Central States have remained stationary. A comparison of the 1900 figures with the localization percentages of Table II shows an exact parallel, though not to such a marked degree relatively to each other. With the marked localization of population in the East we should expect to find relatively a greater number of teachers per building than given in the table, though it must be confessed that the number 4,000 in Table II is entirely too large for any accurate comparison.

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1900	128.3—1	68.3—4	66.6—5	108.7—2	99.2—3
Averages	118.8—1	65.6—4	62.1—5	101.6—2	94.8—3

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Table XI. Average Number of Days Schooling Given for Every Child.

Year.	N. A.-Rank.	S. A.-Rank.	S. C.-Rank.	N. C.-Rank.	West.-Rank.
1870	70.2—1	18.1—5	21.8—4	59.6—2	45.9—3
1880	74.5—1	29.3—4	24.2—5	64.4—2	54.9—3
1890	76.8—1	37.3—4	33.9—5	71.9—2	61.2—3
1900	87.5—1	41.9—4	41.2—5	82.2—2	80.5—3
Averages	77.1—1	31.6—4	30.3—5	70.0—2	60.6—3

The above table in presenting the length of the school year in relation to the actual number of children who should be in school again presents nothing new, it being a combination of Tables IX and III. The large percentage of children in relation to the population and the relatively short terms unite in making extremely low percentages for the South. The North Central Division suffers some in this respect, while the West, having the

least percentage of children, suffers least, making a somewhat better showing than in Table IX. On the whole, the figures with slight modifications duplicate former results. The same may also be affirmed of Table XII, which compounds the length of the school term with the total population.

Table XII. Average Number of Year's (200 Days) Schooling Given to Every Individual.

Year.	N. A.-Rank.	S. A.-Rank.	S. C.-Rank.	N. C.-Rank.	West.-Rank.
1870......	4.43—1	0.80—4	0.78—5	3.71—2	2.77—3
1880......	4.84—1	1.90—4	1.57—5	4.19—2	3.57—3
1890......	4.99—1	2.42—4	2.20—5	4.67—2	3.98—3
1900......	5.60—1	2.72—4	2.68—5	5.34—2	5.23—3
Averages.	4.96—1	1.96—4	1.81—5	4.48—2	3.89—3

Table XIII. Teachers Compared With Pupils, Buildings and Population.

1. Number of Teachers per Building—

Year.	N. A.-Rank.	S. A.-Rank.	S. C.-Rank.	N. C.-Rank.	West.-Rank.
1890......	1.9—1	1.2—4	1.2—5	1.7—2	1.6—3
1900......	2.4—1	1.4—4	1.2—5	1.7—3	1.8—2

2. Enrolled Pupils per Teacher—

Year.	N. A.-Rank.	S. A.-Rank.	S. C.-Rank.	N. C.-Rank.	West.-Rank.
1890......	33.9—2	43.9—4	46.6—5	29.2—1	34.3—3
1895......	34.7—3	43.1—4	47.1—5	31.0—1	33.3—2
1900......	35.7—3	43.9—4	46.7—5	32.0—1	32.9—2

3. Population per Teacher—

Year.	N. A.-Rank.	S. A.-Rank.	S. C.-Rank.	N. C.-Rank.	West.-Rank.
1890......	190.2—2	223.0—5	221.7—4	132.9—1	201.7—3
1900......	202.3—3	212.2—4	217.5—5	144.3—1	166.9—2

The number of teachers to a building is not a sure criterion by which to judge the excellence of a school system inasmuch as it may prove rather a certain localization of population, allowing of a number of grades in a building. However, this makes possible a greater amount of grading, and thus secures more efficient instruction. The low number proves the present existence of a great many of the district schools with but one teacher. It will be noticed that the North Atlantic, the South Atlantic and the West have made some progress in centralization, while the South and North Central States have remained stationary. A comparison of the 1900 figures with the localization percentages of Table II shows an exact parallel, though not to such a marked degree relatively to each other. With the marked localization of population in the East we should expect to find relatively a greater number of teachers per building than given in the table, though it must be confessed that the number 4,000 in Table II is entirely too large for any accurate comparison.

The enrollment to the teacher is a much more accurate means of comparison and it furnishes results highly gratifying to the West. While not a sure criterion, yet as a rule the fewer the children to a teacher, the better is

the resulting instruction. The number of pupils per teacher is increasing in the East and the North, is remaining practically constant in the Southern Divisions, and has made a marked decrease only in the West, and, as will be shown later, this is due to an increase in the number of teachers rather than to any falling off in the number of children. At present the North Central States stand first in this respect, with the West a close second, and the East third, although if present tendencies continue the West should be soon in a pre-eminent position.

The number of the total population per teacher corroborates the above results for the East, West and North. The number has slowly increased for the East and North, while a very marked decrease is shown for the West. These facts, taken in connection with Table III, showing the relation of children to the total population, prove conclusively that the teaching force in relation to the children is being rapidly improved in the West, that it is not being maintained in the East, and that if present tendencies continue, in a few years the West will stand pre-eminent in this feature. That these facts speak strongly for the excellence of instruction and the efficient organization of our common schools can not be denied.

The above inference is strongly supported by a comparison of school taxation and expenditure. As mentioned before, the large proportion of taxpayers to school children is a condition favorable to the West. This is also true of the greater amount of wealth per capita, as may be seen from Table XIV. In the Western Division there are three taxpayers for every two chil-

Table XIV. Property Per Capita and Taxpayers Per 100 Children in 1890.

	N. A.-Rank.	S. A.-Rank.	S. C.-Rank.	N. C.-Rank.	West.-Rank.
Property	$1,232—2	$579—4	$569—5	$1,129—3	$2,250—1
Taxpayers ..	114.4—2	66.8—4	65.9—5	94.6—3	156.7—1

dren between the ages of five and eighteen years, while the ratio would be larger compared with those who actually attend. The West is easily in first place. The East has more taxpayers than children, but her position relative to the West is bettered by the fact that her percentage of enrollment is relatively small. However, eliminating this difference, the West has more taxpayers compared to the children enrolled. This can be seen by a comparison of Tables XIV and VII. The total amount of property per capita is also extremely large in the West, being nearly double that of the East, its nearest competitor. Again, it must be remembered that the percentage of enrollment is high in the West (VII), but yet the above relations are but slightly changed. With this very high percentage of property and taxpayers to the number of school children, no financial reasons can be adduced for poor schools in the Western Division.

Table XV. School Property Per Capita and Per Enrolled Child.

1. Per Capita—

Year.	N. A.-Rank.	S. A.-Rank.	S. C.-Rank.	N. C.-Rank.	West.-Rank.
1890......	7.62—2	1.62—4	1.29—5	7.01—3	8.27—1
1900......	10.37—1	2.24—4	1.85—5	8.77—3	10.35—2
Averages.	9.00—2	1.93—4	1.57—5	7.89—3	9.31—1

2. Per Enrolled Child—

1890......	65.12—2	12.82—4	9.64—5	49.16—3	75.23—1
1900......	59.90—1	10.74—4	8.67—5	39.56—3	52.57—2
Averages.	62.51—2	11.78—4	9.15—5	44.36—3	63.90—1

It will be seen from the above table that in point of school property, both in relation to the population and the enrollment, the West occupies the first position easily in 1890, and for the average for the two years while the place is usurped by the East in both cases in 1900. It will be shown by data following (XVI-XX) that there has been a decided decrease in the West in both expenditure and taxation since the early 90's, and which was probably due to the "hard times" which was so severely felt and from which she is just recovering. In all probability this fact has been the cause for the East securing the first position in the above table for 1900. The high position of the West in this regard is somewhat phenomenal, considering the fact that it is a new country, and is even now in the process of development. Yet it must be remembered that all values are relatively high in the Western States, but even making allowance for this factor, the West in spite of its newness, is a strong candidate for first honors.

The tables (XVI-XX) of school revenue and expenditure give much better data for comparison and show well the falling off in the West, due to the protracted hard times. They also prove beyond doubt the pre-eminence of this section in the amount expended in support of the common schools, although again the relatively higher values enter as a disturbing factor.

Table XVI. Total School Revenue Per Taxpayer.

Year.	N. A.-Rank.	S. A.-Rank.	S. C.-Rank.	N. C.-Rank.	West. Rank.
1890......	9.73—2	4.48—5	4.62—4	10.42—1	9.66—3
1895......	11.80—1	4.93—4	4.64—5	11.41—2	8.28—3
1900......	14.33—1	5.50—4	4.71—5	11.69—2	11.32—3
Averages.	11.95—1	4.97—4	4.66—5	11.17—2	9.75—3

Table XVI gives the total school revenue in comparison to the taxpayers. The rankings are well defined among the divisions. However the comparative results are rendered valueless because of the large percentage in the West of taxpayers to the total population, as is well shown in Table IV. The percentage of taxpayers is 50 per cent. larger in the West than in any other division, and hence the above value is correspondingly decreased. The table taken in connection with succeeding ones shows that the schools can be maintained at a high degree of financial efficiency at a less burden on the taxpayers than in any other division.

Table XVII. School Revenue Per School Child (5-18 Years).

Year.	N. A.-Rank.	S. A.-Rank.	S. C.-Rank.	N. C.-Rank.	West.-Rank.
1890	11.13—2	3.00—5	3.04—4	9.86—3	15.17—1
1895	13.48—1	3.30—4	3.08—5	10.80—3	13.05—2
1900	16.39—2	3.67—4	3.14—5	11.07—3	17.86—1
Averages	13.66—2	3.32—4	3.08—5	10.58—3	15.36—1

The school revenue compared with the number of school children of five to eighteen years of age (Table XVII) needs to be compared with Table III. The low position of the two southern divisions and the North Central States is explained to some extent by their relatively high percentage of children, although this factor is not enough to disturb their relative ranks in this table. Likewise this same factor is favorable to the West in comparison with the East, but again it is not sufficient to affect their ranking. It will be noticed that there has been a steady and regular gain in every section except in the West, where there was a marked diminution in 1895, which was more than regained in 1900. This is undoubtedly due to the financial conditions of the West at that time. With this exception the West holds first rank throughout in the amount of revenue available for the education of her young. Should the same comparison be made with the children enrolled and actually attending (Table VII), it will be found that the pre-eminence of the West will be materially decreased, owing to the small percentage of children enrolled in the Eastern States.

Table XVIII. Expenditure Per Capita of Population.

Year.	N. A.-Rank.	S. A.-Rank.	S. C.-Rank.	N. C.-Rank.	West.-Rank.
1870	2.38—1	.63—5	.73—4	2.14—3	2.15—2
1880	1.97—3	.68—4	.55—5	2.03—2	2.41—1
1890	2.76—3	.99—4	.97—5	2.81—2	3.37—1
1900	3.98—2	1.36—4	1.05—5	3.23—3	4.08—1
Averages	2.77—2	.91—4	.82—5	2.55—3	3.00—1

In the expenditure of moneys for the common schools in relation to the total population (Table XVIII), the West will be seen to occupy the first position, with the exception of the year 1870. The East, the North Central, the South Atlantic, and the South Central follow in order. The large proportion of children (III) in the Southern and North Central Divisions explains their low position, but does not change their rank. Likewise the West has the advantage over the East, but not enough to modify results. A detailed comparison of the same values for each year from 1870 to the present, shows the remarkable fact that the school expenditure per capita of population has been greater in the West than in any other division since 1875—a period of twenty-five years. Before that time the East occupied first rank.

Table XIX. Expenditure Per Capita of Average Attendance.

Year.	N. A.-Rank.	S. A.-Rank.	S. C.-Rank.	N. C.-Rank.	West.-Rank.
1870......	18.31—2	10.27—4	9.06—5	14.87—3	21.87—1
1880......	15.64—2	6.60—4	5.40—5	14.39—3	22.59—1
1890......	23.58—2	7.78—4	7.28—5	19.70—3	30.57—1
1900......	31.72—1	10.68—4	7.34—5	20.85—3	30.44—2
Averages.	22.31—2	8.83—4	7.27—5	17.45—3	26.37—1

The expenditure in proportion to the average attendance (XIX) is likewise of interest and furnishes proof positive of the high position of the West. A slight decrease is noticeable in this section from 1890-1900, which is not present in the other divisions. In fact they all show marked gains. This decrease is undoubtedly due to the economic conditions before mentioned. With the exception of this year the West stands pre-eminent, with the East and North following in order. The same table given for each year from 1870 to 1900 would show that the annual expenditure per capita of the average attendance in the West exceeded by as high as $5 to $7 its nearest competitor for a period of twenty-five years—from 1870 to 1895. During this year the amount sank below that of the Eastern States, but increased rapidly in the latter 90's, promising to again outstrip that of the East in the near future. Here it must be remembered that the school term is much longer in the East, and that $30 per pupil for the year means much less than in the West, where there are thirty-one days less school per year. With this correction the above values for the West will be increased by nearly 20%, giving the West the first rank for 1900, as well as for the other years, although the difference in values must be borne in mind.

The result of this correction is strikingly evident from Table XX, giving the *daily* expenditure per pupil for the last decade. This eliminates the variable—the length of the school year. There is a steady and regular diminution in the South Central Division, as well as decrease in the West for 1895, thus confirming the effect of the financial stress. However, in spite of this diminution and the regular increase in the East, the West continues to easily hold its rank. Even during this period of low expenditure in the West, it can be seen that each pupil in this section throughout his elementary and high school course has had on an average for the three years 5⅔ cents more per

Table XX. Daily Expenditure Per Pupil.

Year.	N. A.-Rank.	S. A.-Rank.	S. C.-Rank.	N. C.-Rank.	West.-Rank.
1890......	.141—2	.078—5	.083—4	.133—3	.225—1
1895......	.155—2	.081—4	.077—5	.141—3	.203—1
1900......	.179—2	.095—4	.074—5	.134—3	.209—1
Averages.	.158—2	.085—4	.078—5	.136—3	.212—1

day expended upon his education than a pupil in the East. The amount on the average is 2½ times greater than that in the South. The West ranks

easily first, with the East, the North and the Southern sections following in order.

Whether this relative expenditure represents a corresponding efficiency is difficult to answer, because of the difference of values. Table XX may be further differentiated as in Table XXI and by taking the values representing salaries (Table XXI, 1) and comparing them with the average monthly salaries of teachers which are approximately $52.25, $44.50 and $42.50 for the West, East and North respectively, so as to eliminate this difference in value,

Table XXI. Average Daily Expenditure Per Pupil.

Year.	N. A.-Rank.	S. A.-Rank.	S. C.-Rank.	N. C.-Rank.	West.-Rank.
1. Salaries—					
1890......	.085—3	.061—5	.068—4	.087—2	.144—1
1895......	.090—2	.063—5	.064—4	.089—3	.131—1
1900......	.103—2	.066—4	.063—5	.087—3	.142—1
Averages.	.093—2	.063—5	.065—4	.088—3	.139—1
2. Other Expenses—					
1890......	.056—2	.017—4	.015—5	.046—3	.081—1
1895......	.065—2	.018—4	.013—5	.052—3	.072—1
1900......	.076—1	.029—4	.011—5	.047—3	.067—2
Averages.	.066—2	.021—4	.013—5	.048—3	.073—1

we find that the relative positions of the three divisions do not change for the average of the three years. Section 2 of the same table giving the daily expenses other than for salaries shows a marked and steady decline in the Western and South Central Divisions, but still the sections keep the same relative rank on the average.

These expenses other than salaries are again differentiated in Table XXII, into (2) Sites, Buildings and Equipment, and (3) Maintenance, but on the basis of the school year. Here it will be noticed the money devoted to maintenance has increased rapidly in every division, but the West easily maintains her lead with the other divisions following in their regular order. This predominance of the West would be still further accentuated if the comparison were made on a basis of daily expenditure. Section (2) dealing with Sites, Buildings and Equipments, exhibits a marked decrease in the West.

Table XXII. Average Annual Expenditure Per Pupil.

Year.	N. A.-Rank.	S. A.-Rank.	S. C.-Rank.	N. C.-Rank.	West.-Rank.
1. Salaries—					
1890......	14.16—2	5.92—5	5.98—4	12.85—3	19.46—1
1895......	15.54—2	6.68—4	6.35—5	13.66—3	18.67—1
1900......	18.16—2	7.38—4	6.23—5	13.56—3	20.62—1
Averages.	15.95—2	6.66—4	6.19—5	13.36—3	19.58—1

2. Sites, Buildings and Equipments—

1890......	5.33—2	.95—4	.76—5	3.42—3	7.10—1
1895......	5.94—1	.87—4	.80—5	3.70—3	4.66—2
1900......	7.38—1	1.06—4	.45—5	3.60—2	3.22—3
Averages.	6.21—1	.96—4	.67—5	3.57—3	4.99—2

3. Maintenance—

1890......	4.09—1	.76—4	.60—5	3.43—3	3.89—2
1895......	5.36—2	1.04—4	.54—5	4.24—3	5.58—1
1900......	6.18—2	2.24—4	.66—5	3.69—3	6.60—1
Averages.	5.21—2	1.35—4	.60—5	3.79—3	5.36—1

The amount has fallen from $7.10 to $3.22 in ten years, it being in 1900 less than one-half of the amount in 1890. The South Central states have also decreased but in less a degree. The other divisions have maintained a steady increase. The West occupied first position in 1890 but fell to second in 1895 and third in 1900. In maintenance the West still retains its increase and position. It is evident that the decrease noticed in the daily expenditure per pupil (Table XX) in the West and the South Central Division is in the amount devoted to the items, Sites, Buildings, and Equipment of Section 2, Table XXII. An attempt was made to determine whether this decrease was in the expenditure devoted to Sites and Buildings, or in that devoted to Equipment. However, no further differentiation of these expenditures could be furnished by the Commissioner of Education. The forced economy of the schools at this time due to the severe financial conditions seems to have cut off merely an extension of building and equipment in the West without any marked effect upon the salaries and maintenance. But in spite of this decrease the West stands second for the average of the three years in this item. While it was found that in the matter of salaries, an elimination of the variable caused by a difference of value, did not affect the respective ranks of the divisions, yet in these other regards no means of accurate comparison are available, and it must remain a matter of conjecture and opinion whether these rankings in expenditure would also indicate the relative efficency of the schools.

Summarizing we see that the tables which have value for our comparison are those dealing with, 1st, the percentage of enrollment (VII); 2nd, the regularity of attendance (VIII); 3rd, the amount of schooling (IX); 4th, the enrollment per teacher (XIII); and 5th, the financial support and equipment (XIV-XXII).

The last three items are conclusive in every respect and show without doubt the relative standing of the divisions; these may be tabulated as follows:

Item.	1.	2.	3.	4.	5.
Length of School Year....................	N. A.	N. C.	W.	S. A.	S. C.
Enrollment per Teacher....................	N. C.	W.	N. A.	S. A.	S. C.
Financial Support	W.	N. A.	N. C.	S. A.	S. C.

Thus the position of the Southern sections seems to be well determined; the others each occupy a first, second, and third place, making them on a par, if each of the items have equal value. If we should assume that the enrollment per teacher and the financial support indicate the relative efficiency of the schools, then the West, the North and the East would be ranked in order, and the above tabulation would be combined as follows:

Item.	1.	2.	3.	4.	5.
Amount of School	N. A.	N. C.	W.	S. A.	S. C.
Efficiency	W.	N. C.	N. A.	S. A.	S. C.

The first and second of the above items (enrollment and regularity of attendance) are not at all conclusive as to the ranking of the divisions, because of the element of fluctuation of position during the thirty years' period, and as a consequence it is much more difficult to make any just estimate. However, in the percentage of enrollment (VII) it will be noticed that there is a marked and steady decrease in the East and North since 1870, while the West has made a steady increase. Present conditions (1900) therefore are not due to a sudden fluctuation, but represent the sum of 30 years' tendencies. Thus the figures of 1900 should fairly represent the real status of enrollment at the present time, and hence they have been taken as a basis of comparison.

The table of regularity (VIII) is very unsatisfactory. The East shows a steady increase, but the others fluctuate in a very marked manner. A detailed comparison of each year since 1870 give the same results: The East steadily increases from year to year, but the others vary widely on successive years. Hence an average for the last 10 years was computed and taken as a basis of comparison. These results are given in Table XXIII below:

Table XXIII. Daily Attendance Per 100 Enrolled.

Year.	N. A.	S. A.	S. C.	N. C.	West.
90-91	66.00	62.00	63.20	64.50	63.50
91-92	66.36	60.81	63.31	65.70	65.39
92-93	66.68	61.17	62.86	67.60	67.10
93-94	67.80	62.14	64.17	66.82	68.14
94-95	68.61	62.44	63.84	66.65	68.73
95-96	69.10	62.56	66.74	69.12	69.58
96-97	71.33	61.57	67.52	70.32	71.37
97-98	71.60	61.59	65.07	70.50	69.38
98-99	72.29	60.42	67.52	69.60	71.50
99-00	72.43	61.02	66.80	69.84	68.08
Ave	69.22—1	61.57—5	65.10—4	68.06—3	68.27—2

If this be accepted then the positions for the four items would be:

Item.	1.	2.	3.	4.	5.
Amount	N. A.	N. C.	W.	S. A.	S. C.
Efficiency	W.	N. C.	N. A.	S. A.	S. C.
Enrollment	W.	N. C.	N. A.	S. C.	S. A.
Regularity	N. A.	W.	N. C.	S. C.	S. A.

The last two items might be combined as fairly indicative of the interest taken in education, and the results would then stand:

Amount	N. A.	N. C.	W.	S. A.	S. C.
Efficiency	W.	N. C.	N. A.	S. A.	S. C.
Interest	W.	N. A.	N. C.	S. C.	S. A.

If these items be considered of equal value, then the educational status of the five divisions in the matter of public education would be:

1, West; 2, North Atlantic; 3, North Central; 4, South Atlantic, and 5, South Central, although it must be confessed that some of the methods of comparison are very faulty.

From Table II it will be recalled that the percentages of the total population living in cities of 8,000 or more for 1890 were:

N. A.-R.	S. A.-R.	S. C.-R.	N. C.-R.	West.-R.
51.81—1	16.03—4	10.45—5	25.91—3	29.99—2

A good school system would naturally be inferred in these places of high localization of population, but what effect this has upon the ranking of the total division is very difficult to determine, in any accurate manner. Table XXIV was prepared for the four items. The percentages for the four years following 1890 were averaged for the cities of 8,000 or more, and then for the total divisions.

Table XXIV. Average for the Four Years ('90-'94) for Cities of 8,000 and Over, and for Total Division, for:

	N. A.-Rank.	S. A.-Rank.	S. C.-Rank.	N. C.-Rank.	West.R.
1. Regularity—					
Cities	71.7—3	71.7—4	71.8—2	74.4—1	71.2—5
Total	67.2—2	61.6—5	62.8—4	66.7—3	67.3—1
2. Amount—					
Cities	194.5—1	187.6—4	182.7—5	188.1—3	190.6—2
Total	171.2—1	106.0—4	97.2—5	148.4—2	139.7—3
3. Pupils per teacher—					
Cities	35.4—1	36.0—2	37.6—5	36.4—3	36.4—4
Total	34.8—3	43.7—4	46.8—5	30.7—1	33.5—2
4. Daily expenditure—					
Cities	.163—2	.120—5	.122—4	.167—3	.219—1
Total	.152—2	.081—4	.080—5	.140—3	.222—1

It will be noticed that the regularity of attendance is decreased by the country districts, and that it is practically uniform in the cities for all divisions. The low positions of the Southern sections in regularity is thus accounted for by her larger percentage of rural population. Eliminating this

difference, the ranking of the divisions for regularity in the country districts would be:

1.	2.	3.	4.	5.
W.	N. C.	S. A.	S. C.	N. A.

whereas for the general summary the positions were:

N. A.	W.	N. C.	S. C.	S. A.

This difference of localization thus advances the West, North Central and the South Atlantic in rank, while the East is reduced from the first to the last position.

In the length of the school year, the rankings for the total division and for the cities are identical, except that the West is advanced to second place. The percentage of country population reduces the length of the year in each division as follows:

	N. A.	S. A.	S. C.	N. C.	W.
Percentage	48.19	84.00	89.55	74.00	70.00
Days decrease	23.5	81.6	85.6	39.7	51.

By finding the fraction of a day which 1 per cent. of country population would reduce the length of the school year, a fair standing of the divisions in regard to this item for the rural and suburban districts should result. These are:

1.	2.	3.	4.	5.
N. A.	N. C.	W.	S. C.	S. A.

whereas the general summary was:

N. A.	N. C.	W.	S. A.	S. C.

the only change being in the relative positions of the two southern sections.

It will be noticed that the number of pupils per teacher is lowered because of the rural districts in the East, North and West, while it is markedly increased in the two Southern sections. Furthermore it is evident that for the cities there is but little difference between the divisions. Probable these values represent a norm, and hence the rural schools in the three Northern sections have small numbers because of the lack of children per district, while the contrary is true of the South. This is detrimental to the South, but no evidence of superiority of organization in the North. However in proportion to the people the decrease is relatively greater in the North Central Division with the West and East following in order.

In daily expenditure in the cities the divisions have the same rank as for the total. The rural districts do not modify results. The expenditure is decreased in all divisions with the exception of the West. Here, strange to say, the daily expenditure per pupil is increased by bringing in the rural districts.

Because of the difference of localization the East is greatly benefited in regularity at the expense of the other sections, the North and West are benefited slightly at the expense of the East in the matter of enrollment per

teacher, and the two Southern sections are each benefited once at the expense of the other. Hence it is obvious that the difference of localization does not materially affect the results as given in the general summary.

SECONDARY EDUCATION.

While the former section dealt with both public elementary and secondary work, the following statistics deal only with secondary education and includes both public and private schools of every description which give work corresponding to secondary instruction.

Table XXV. Average Percentage of Secondary Students in '95, '97, and '99 Pursuing

	N. A.-Rank.	S. A.-Rank.	S. C.-Rank.	N. C.-Rank.	West.-Rank.
Latin	46.93—4	58.14—1	47.94—3	45.43—5	48.08—2
Greek	8.24—1	4.63—2	3.60—4	2.08—5	3.83—3
French	20.00—1	13.26—2	6.10—4	3.28—5	7.43—3
German	18.24—1	10.63—4	5.46—5	13.05—2	12.99—3
Algebra	50.29—5	61.81—2	62.20—1	53.49—4	58.44—3
Geometry	26.54—4	26.88—3	27.56—2	24.33—5	32.70—1
Trigonom	2.50—4	5.37—2	6.65—1	1.86—5	4.04—3
Astronomy	5.54—1	4.68—3	5.53—2	4.02—4	3.64—5
Physics	19.68—5	23.05—3	26.45—1	20.18—4	23.08—2
Chemistry	10.08—2	8.47—4	8.65—3	7.95—5	13.35—1
Phys. Geog.	19.19—4	25.60—3	29.27—1	25.82—2	18.85—5
Geology	6.11—2	3.25—5	7.39—1	3.81—4	5.06—3
Physiology	26.54—4	27.81—3	38.77—1	29.93—2	17.57—5
Psychology	2.37—5	3.59—2	7.15—1	3.42—3	3.24—4
Rhetoric	31.28—5	33.79—4	36.47—2	34.11—3	43.60—1
History	38.02—4	45.87—2	38.11—3	31.37—5	49.56—1
Eng. Lit.	43.69—2	41.23—3	33.63—5	35.38—4	61.08—1
Civics	16.73—4	12.64—5	25.88—1	25.02—2	19.16—3
Preparing for College	18.55—2	18.10—3	19.30—1	12.00—5	17.60—4
Graduates prepared for College	30.02—5	34.31—3	38.30—2	31.74—4	41.73—1

Table XXV gives the percentage of the entire number of secondary students pursuing the different branches averaged for the years 1895, 1897, and 1899. The values for English Literature and Civics embrace the years '98 and '99 only. By noticing the relative positions of the sections in each subject, it will be seen that the North Central Division occupies first rank in no case, but as in the former tables it tends to occupy a medium position. In the number of first positions, the South Central leads with the West, East, South Atlantic and North following in order. Grouping these studies, the positions

may be roughly indicated as follows, as at least indicative of the predominant interests in the divisions:

	1.	2.	3.	4.	5.
Classics	S. A.	N. A.	W.	S. C.	N. C.
Modern Languages	N. A.	S. A.	W.	N. C.	S. C.
Mathematics	S. C.	S. A.	W.	N. C.	N. A.
Sciences	S. C.	S. A.	W.	N. C.	N. A.
Humanities	W.	S. C.	S. A.	N. A.	N. C.

Whatever interpretation may be put on the above, the fact remains that the West and the South Atlantic Divisions stand high in all the above groups, never sinking below third place. The East stands high in the languages, but is low in the other three. The South Central is high in mathematics, science and the humanities, but is low in the languages, while the North Central is low in every respect. This would indicate a high degree of general interest throughout the curriculum in the South Atlantic and Western Divisions, a low degree in the North Central, and a specialization of interest in the North Atlantic and South Central Divisions with a consequent low degree in other lines. A noteworthy fact quite contrary to the general assumption is the high position of the West in the study of English, history and literature, and the first rank of the South Central states in science and mathematics.

Lack of laboratory equipments in the poorer schools and a consequent specialization in the "text-book courses" might be adduced to explain the above. With this explanation the best equipped schools would be found in the Southern sections and in the West, with a low degree of equipment in the North and East, which is quite contrary to the general assumption.

Again a concentration of interest in certain branches, with a low degree of interest might be argued and we find this to some extent in the East and South Central section, but this would still leave the West and the South Atlantic Division in the lead in a general interest almost equal to the special interests of the former two, while the South Central Division would have a more general specialization than the East.

An abundance of other subjects not classified above could be offered as an explanation of the low position of the North and East, but this is hardly probable.

Again the explanation could be offered that the West and South Atlantic Division have higher standards, that the different subjects are required for three or four years and for a less time in the other sections, and hence the percentage of students in these branches is increased by that ratio.

A last explanation may be offered that in certain sections there are a large number of high schools with poor equipment and a short course of study, while in the other sections there are a fewer number of schools but all of high standards. For instance the high schools in the South might be few in number but located in the larger cities and consequently first-class in equipment and requirements, while in the North we might find as large or even larger number as finely equipped, but also a large per cent. of the total number

located in the smaller towns and villages and consequently comparatively poor in grade. This condition would explain the above facts and it meets with some confirmation from the following statistics:

Table XXVI. Percentage of Total Students Averaged for '95, '97, and '99 Pursuing

	N. A.-Rank.	S. A.-Rank.	S. C.-Rank.	N. C.-Rank.	West.-Rank.
Scientific C..	6.71—3	4.57—5	7.20—2	6.40—4	10.32—1
Classical C..	11.51—3	13.52—1	12.10—2	5.60—5	7.28—4

The above table is somewhat anomalous considered in reference to the percentages for each study. The South Central section stood first in mathematics and the natural sciences while here the West ranks first in the scientific course. The South also stood fourth in the two classic languages and here it occupies second position, even ahead of the East, which occupied the first rank in the former tabulation. It will be noticed that in the East and Southern sections the percentage is greater in the classical course than in the scientific, while the reverse is true in the North and West. Varying requirements in the different divisions as to what constitutes the two courses is the only explanation that can be offered.

Table XXVII. Percentage of Total Population in High Schools.

Year.	N. A.-Rank.	S. A.-Rank.	S. C.-Rank.	N. C.-Rank.	West.-Rank.
1890......	.72—2	.39—4	.35—5	.65—3	.76—1
1900......	1.08—2	.55—5	.58—4	1.20—1	1.05—3
Averages.	.90—3	.47—4	.47—5	.92—1	.91—2

Table XXVII shows that the three Northern sections are almost on a par in regard to the high school enrollment and have about double the number in proportion to the population as in the two Southern sections. However, Table III, dealing with the proportion of children in the population, must be kept in mind. The West has by far the smallest proportion of children and consequently would have the largest percentage of the children attending the high schools. The East and North would follow, while the Southern sections, with their large proportion of children in the population, would be decreased in rank still more. This table would tend to prove a localization of the high schools in the Southern sections in the larger centres of population.

Table XXVIII. Percentage of the Elementary Students Pursuing Secondary Education.

Year.	N. A.-Rank.	S. A.-Rank.	S. C.-Rank.	N. C.-Rank.	West.-Rank.
1890......	3.49—2	1.85—4	1.52—5	2.66—3	4.17—1
1895......	4.36—1	2.41—4	2.35—5	4.09—3	4.25—2
1900......	5.70—1	2.53—5	2.60—4	5.25—2	5.21—3
Averages.	4.52—2	2.26—4	2.14—5	4.00—3	4.54—1

The above table deals with the percentage of those who go into secondary work from the grades. The results are much more indicative of the status of secondary education than those of the former table. The West again leads and the Southern sections occupy a low position, the percentage being but a half of that of the West. Here again the large percentage of children who are enrolled in the grades in the Western Division (VII) would give that section a rank above that indicated above, while the position of the Southern sections would be lowered. The figures are of significance in showing the general comparative interest in secondary education.

Table XXIX. Percentage of Secondary Students Pursuing Higher Education.

Year.	N. A.-Rank.	S. A.-Rank.	S. C.-Rank.	N. C.-Rank.	West.-Rank.
1890......	36.66—3	48.92—1	47.02—2	34.52—4	18.32—5
1895......	39.94—2	49.52—1	37.59—3	34.75—4	35.24—5
1900......	31.32—4	48.36—1	36.26—2	30.95—5	33.26—3
Averages .	35.97—3	48.93—1	40.29—2	33.41—4	29.27—5

The above table giving the percentage of the secondary students who enter college has no significance on the comparative status of higher education in the divisions, because of the varying conditions of secondary education itself. The number of secondary students is comparatively small in the South, and a large percentage of their number who enter college might still be small in relation to the total number of pupils, or in relation to the total population. The table is, however, significant of the status of the high schools themselves. The relative positions of the divisions are almost in inverse order to what they are in the former tables on secondary education. In the South the very low per cent. of the elementary pupils who enter the high schools and the very large per cent. of these who go on into higher education prove conclusively that the high schools are strongly localized in the larger towns and cities among the better classes, that they are consequently few in number and have good equipments and standards. This is especially marked in the South Atlantic Division and would explain her high rank in all the five groups of studies tabulated above. The same is also true of the South Central Division and her low position in the languages must be explained on the grounds of local interest and specialization. This assumption is also borne out by the fact that in these two sections less than 20 per cent. of the population is found in cities of 4,000 and over.

Table XXX. Number of Population to One High School (1900).

N. A.-R.	S. A.-R.	S. C.-R.	N. C.-R.	West.-R.
10,491—2	13,337—4	25,964—5	4,165—1	11,325—3

This supposition is confirmed by the above table for 1900, showing the large percentage of the population to one high school. If this were given in terms of children of school age the positions of the Southern sections would be lowered and that of the West increased to the second rank. Thus in re-

gard to the South it is safe to say that the high schools are few in number, that they are limited to the better classes, that the standards and equipment are first-class in what schools there are, that there is a general diffusion of interest throughout the curriculum in the South Atlantic, and a specialization of interest in mathematics, science, and the humanities in the South Central Division.

In regard to the North Central Division it will be remembered that it has the lowest position in percentage of students in the various branches of the curriculum, that the number of students compared with the population is of first rank, that there is a relatively high percentage of the elementary students who enter the high school, but a relatively low number of these entering higher education, that the number of high schools in proportion to the population is over twice as great as any other section, and that over 70 per cent. of the population is located in places of less than 4,000 inhabitants. This would indicate a general diffusion of interest in the curriculum, a very wide extension of the high school system among all classes of the people, but at the expense of a high standard of equipment and efficiency, i. e., there is a very large number of small high schools in the smaller towns and villages poor in equipment and requirements. The South and the North exhibit exactly opposite tendencies.

In the East we find a high position in the modern languages and the classics and a low one in the humanities and especially in mathematics and the sciences, and medium positions in regard to the distribution of the high schools among the people, the number of elementary students entering secondary work and the percentage of these entering higher education. Forty-five per cent. of the people only are found in centres of less than 4,000, a percentage lower than in any other division. With this fact in mind, the distribution in regard to means of support is not greater than in the South. If we have a medium distribution but an extremely large number of places of over 4,000 inhabitants, a medium number of students, and a rather low ranking in the general interest of the curriculum, not very high standards of equipment and requirement in relation to what ought to be reasonably expected can be assumed. The specialization of interest noted would indicate a high standard in the languages but poor standards and requirements in science, mathematics, and the humanities.

In the West 65 per cent. of the population are outside of towns of over 4,000 people, it being second in point of localization, while the distribution of the high schools among the people is a trifle lower than in the East. Eliminating the factor of localization, and considering the distribution of the high schools in relation to the places where they can be reasonably expected, the East and the West are practically on a par. However, the proportionate percentage of students in secondary work is greater in the West, i. e., eliminating the difference of localization, the enrollment is much greater. The high rank of the West in all branches of the curriculum would show a general interest and a high standard of equipment and requirement which is very general throughout the secondary schools. The number of those with low standards is reduced to a minimum.

Considering the facts that there is a high enrollment and that relatively the smallest per cent. enter higher education, it might be argued that the West possesses many high schools of but a two or three year course. This is disproved from the following table:

Table XXXI. Percentage of Secondary Students.

N. A.-R.	S. A.-R.	S. C.-R.	N. C.-R.	West.-R.
1. Preparing for college ('95, '97, '99)—				
18.55—2	18.10—3	19.30—1	12.00—5	17.60—4
2. Graduates prepared for college ('95, '97, '99)—				
30.02—5	34.31—3	38.30—2	31.74—4	41.73—1
3. Pursuing higher education ('90, '95, '00)—				
35.97—3	48.93—1	40.29—2	33.41—4	29.27—5

Here it may be noted incidentally that throughout the divisions nearly twice as many students actually go on into higher education as expected to during their high school course. The West stands very low in those who expect to go to college and also those who do, but stands first in the number of her graduates who are prepared to do so. This means that a large per cent. of her high schools are of a high grade. The percentage of students who actually graduate might be given and it would show the West of high rank, but this fact would prove nothing as to the length and quality of the course.

These various facts may be grouped and tabulated under three heads: The distribution of the high schools in relation to the population, the interest in secondary education, and the efficiency of the schools in relation to the students.

Table XXXII. Distribution of High Schools to Population.

	N. A.	S. A.	S. C.	N. C.	W.
Localization of Population	1	4	5	3	2
Number of H. S. to Population	2	4	5	1	3
Enrollment to Population	3	4	5	1	2
Resulting Rank	3	4	5	1	2

The first heading indicates in a way what should naturally be expected in the number of high schools and the enrollment compared to the total population, or a norm to which the other two should conform. The two Southern sections occupy fourth and fifth positions in distribution and conform to the localization of the people. The conclusion is that secondary education is largely confined to the larger towns and cities. The North is third in localization of population but nevertheless stands first in the number of high schools and the enrollment compared to the total population. This shows the widest distribution of secondary education among the people. The West is second to the East in the matter of localization, but is on a par in the number

of high schools and the enrollment to the population. This should put the West second in regard to distribution.

Table XXXIII. Interest in Secondary Work Among the Pupils.

	N. A.-R.	S. A.-R.	S. C.-R.	N. C.-R.	West.-R.
Distribution.	3.	4.	5.	1.	2.
Per ct. of Ele. in H. Schools.	4.52—2	2.26—4	2.14—5	4.00—3	4.54—1
Per ct. of students graduat'g.	12.78—1	9.44—4	8.16—5	12.31—2	12.09—3
Graduates prepared for Coll..	30.02—5	34.31—3	38.30—2	31.74—4	41.73—1
Students in higher work.....	35.97—3	48.93—1	40.29—2	33.41—4	29.27—5

In the matter of interest any definite ranking is utterly impossible, yet the above table indicates roughly a few conclusions. The West stands second in the distribution of the high schools among the people, but yet is first in the percentage of all the elementary students who are pursuing secondary work, i. e., in the West there is a less opportunity for every elementary student to attend the high schools, yet more of them actually do than in the North Central Division. The attendance is thus above the norm. If the distribution of high schools were large, the percentage of attendance should be large, i. e., the distribution may be taken as a norm, and any deviation from this in attendance be considered as an indication of interest. Thus the Southern sections would conform to the norm, a lack of interest would be found in the North, while a prevailing interest would characterize the West and East. The fact that in the West a large per cent. of the students graduate, a very large per cent. of these are prepared for college, while a very small percentage actually attend, shows a very high interest in secondary work. The tentative conclusion would be that in the West there is a high interest widely distributed, a high interest less widely distributed in the East, a normal interest confined to a small portion of the population in the two Southern sections, and in the North an intensive interest lowered because of the wide distribution among all classes of the people. In other words, the interest among those who have an opportunity to attend is high in the East and West, normal in the South and low in the North.

Table XXXIV.

	N. A.-R.	S. A.-R.	S. C.-R.	N. C.-R.	West.-R.
Children to total population..	26.85—4	33.10—2	33.93—1	30.78—3	25.01—5
Per ct. of children enrolled..	68.09—3	61.37—5	61.90—4	75.68—2	81.13—1
Per cent. of attendance......	69.22—1	61.57—5	65.10—4	68.06—3	68.27—2
Per cent. in High School.....	4.52—2	2.26—4	2.14—5	4.00—3	4.54—1
Per cent. of these graduating.	12.78—1	9.44—4	8.16—5	12.31—2	12.09—3
Grad. prepared for college...	30.02—5	34.31—3	38.30—2	31.74—4	41.73—1
Per cent. in college..........	35.97—3	48.93—1	40.29—2	33.41—4	29.27—5

The course of the students on entering the grades till they enter some form of higher education may be shown by the above. In the South there is

a large percentage of children, but few are enrolled, the attendance is small, but few go on into secondary work, a small per cent. of these graduate, but a large percentage of these are prepared for and enter college. Relatively the largest number keep dropping out until the end of the High School course, where relatively the smallest number drop out. The opposite is true for the West, as is also for the East with the exception that the number first entering is small. The North as usual occupies a medium position.

Table XXXV. Standard of Work in Secondary Schools.

	N. A.-R.	S. A.-R.	S. C.-R.	N. C.-R.	West.-R.
Per ct. of Ele. in H. Schools.	4.52—2	2.26—4	2.14—5	4.00—3	4.54—1
Per ct. of students graduat'g.	12.78—1	9.44—4	8.16—5	12.31—2	12.09—3
Graduates prepared for Coll..	30.02—5	34.41—3	38.30—2	31.74—4	41.73—1

The percentage of the secondary students who graduate has no bearing upon the length of the course, but taken in connection with the number of elementary students entering the high schools and the great percentage of elementary students enrolled in the West, it will be seen that there is but little difference in the proportionate number of high school graduates in relation to the total number of children or to the population. If the relative number of graduates in the three northern divisions are practically identical, then the percentage of these who are prepared for college irrespective of whether they have intended to or whether they have actually entered college, must bear some relation to the average length of the high school courses throughout the divisions.

This would put the Western and the Southern Sections in the lead, but this cannot be taken as an absolute criterion. The high position of these sections in all branches of the curriculum (XXV) also bears out the assumption to some extent. From what we know of distribution and localization we should expect a large number of high schools with but a few years' course especially in the North Central Division. Of course a high average length of course of study does not necessitate a high internal efficiency. The ranking of the divisions in the percentage of students prepared for college taken as a criterion for the average length of the course is only a probable conclusion, but yet it is the only statistical evidence we have.

Summarizing the two Southern sections would have a normal interest and a high standard of work confined to a small part of the population; the North would possess opposite characteristics, the interest and high grade of work suffering at the expense of distribution; in the East the distribution is medium, interest high, but length of courses low on the average; while the West would have a high interest and a high standard of work well distributed.

Table XXXVI. Financial Support. 1899-'00.

	N. A.-R.	S. A.-R.	S. C.-R.	N. C.-R.	West.-R.
Income per school..........	3561.—1	1820.—3	1489.—4	1223.—5	3037.—2
Income per pupil............	36.54—1	32.90—3	26.73—4	15.50—5	35.98—2

Table XXXVII.

Students per school	94.7 —1	55.4 —5	55.7 —4	79.0 —3	84.2 —2
Teachers per school	5.1 —1	3.2 —4	2.9 —5	3.3 —3	4.4 —2
Students per teacher	18.6 —2	17.3 —1	18.9 —3	24.0 —5	19.0 —4

Matters are still further complicated by the above tables. In financial support the East is slightly in advance of the West, with the other sections far in the rear. This should indicate general efficiency to quite an extent. Table XXXVII may be interpreted in different ways, but the real significant item is the relation of the teaching force to the number of scholars, but here the rankings correspond largely to the distribution of the schools and the enrollment.

On the whole it is impossible to assign any ranks on the general status of secondary education in the divisions, but at the very least it may be said that the West is on a par with any other division, notwithstanding the fact that all forms of secondary education are here considered.

HIGHER EDUCATION. (1)

It will be remembered that in the percentage of secondary students pursuing advanced work, the two Southern sections led with the East third, while the West was very low. This cannot be taken as an accurate indication of comparative attendance in higher education, inasmuch as secondary attendance itself differs widely among the divisions. This may be seen from Table XXXVIII below. If but a small percentage of the children attend the grades, a

Table XXXVIII.

1. Percentage of children of school age enrolled.
2. Percentage of elementary enrolled in secondary education.
3. Percentage of secondary students enrolled in higher education.

	N. A.-R.	S. A.-R.	S. C.-R.	N. C.-R.	West.-R.
1. Elementary	68.09—3	61.37—5	61.90—4	75.68—2	81.13—1
2. Secondary	4.52—2	2.26—4	2.14—5	4.00—3	4.54—1
3. Higher	35.97—3	48.93—1	40.29—2	33.41—4	29.27—5

small percentage of these enter secondary work, as in the South, a large per cent. of these might enter college, and yet the number in comparison with the number of children or total population be relatively small. In the West a

(1) Higher education embraces the work of colleges and universities for men and both sexes, colleges for women, all schools of technology, the professional schools of law, theology, medicine, pharmacy, etc. The term is rather broad inasmuch as all schools here included do not necessarily presuppose a high school equipment for entrance. Especially is this true of many of the lower class schools of law, theology and pharmacy. However, it is impossible to eliminate this factor so as to include only those who are graduates of high schools. The statistics for higher education do not admit of the same degree of systematization as those relating to elementary education and hence any detailed comparison of the divisions is impossible.

large per cent. of the children are in the grades, a large percentage of these are in the high schools, so that a small per cent. of these pursuing higher education might still be comparatively large.

A direct comparison is much more satisfactory. Table XXXIX gives the percentage of the total population who are pursuing advanced work in the five divisions. There has been a steady and marked gain in the West and North, with fluctuations in the remaining divisions. On the average for the five years the North Central, the East and the West stand in order, though there

Table XXXIX. Percentage of Total Population in Higher Education.

Year.	N. A.-Rank.	S. A.-Rank.	S. C.-Rank.	N. C.-Rank.	West.-Rank.
1895-6......	0.34	0.26	0.20	0.33	0.32
1896-7......	0.34	0.26	0.21	0.34	0.32
1897-8......	0.35	0.27	0.20	0.34	0.34
1898-9......	0.34	0.26	0.20	0.34	0.34
1899-00.....	0.33	0.27	0.21	0.37	0.35
Averages.	.034—2	0.26—4	0.20—5	0.34—1	0.34—3

is but a very small fraction of one per cent. difference between them. Practically they are on a par with the Southern sections in a low position. However, it must be remembered that in the West there is a large percentage of adult males (Table IV) and a small percentage of children to the total population (Table III), which facts put that section at a serious disadvantage in the above comparison.

The figures of Table XL indicate the percentage of the total number of students enrolled and receiving formal instruction who are in some phase of higher education. The percentages vary slightly from year to year, showing no general tendency. The average results for the five years should fairly indicate the real status of the divisions in this respect. These results cannot be taken as an absolute criterion of attendance, as they are open to a serious objection. In the West the attendance in the grades and secondary schools

Table XL. Percentage of All Pupils in Higher Education.

Year.	N. A.-Rank.	S. A.-Rank.	S. C.-Rank.	N. C.-Rank.	West.-Rank.
1895-6......	1.62	1.20	0.88	1.33	1.55
1896-7......	1.62	1.16	0.91	1.38	1.53
1897-8......	1.66	1.17	0.86	1.36	1.67
1898-9......	1.64	1.15	0.88	1.43	1.70
1899-00.....	1.66	1.18	0.91	1.52	1.62
Averages...	1.64—1	1.17—4	0.89—5	1.40—3	1.61—2

was very high and consequently the attendance in higher education might be high absolutely and yet low in comparison. In the East the opposite is true; elementary attendance is relatively low, and hence in comparison the percentage of attendance in higher education is increased.

Table XLI. Percentage of the Children of School Age in Higher Education.

Year.	N. A.-Rank.	S. A.-Rank.	S. C.-Rank.	N. C.-Rank.	West.-Rank.
1895-6....	1.36—1	0.78—4	0.58—5	1.12—3	1.31—2
1897-8....	1.37—2	0.79—4	0.59—5	1.14—3	1.38—1
1899-00...	1.33—2	0.77—4	0.60—5	1.26—3	1.43—1
Averages.	1.35—2	0.78—4	0.59—5	1.17—3	1.37—1

The attendance may be compared also with the total number of children of school age (5-18 years) irrespective of whether they attend or not. Here the positions of the East and West are reversed from that of the former table. In this comparison the West is at an advantage, since the number of children in proportion to the total population is relatively small.

In the question of comparative attendance all three of the above tables must be considered. In relation to the total population the East, North and West are on a par, in relation to attending pupils, the East, West and North are in order, and in relation to the number of children the West has first rank, with the East and North second and third respectively. No one represents a norm. Taking the three items together, there is but little difference between the East and West, with the North Central division a shade lower.

The above tables deal with the attendance in every branch of higher education, including medicine, theology, pharmacy, etc. The East has more schools of this character and hence her attendance is correspondingly increased. Table XLII below deals only with college students, the more distinctive part of higher education. In comparison with the total population, the college attendance in the West is very high, that division easily holding first rank, while if the comparison were made in relation to the number of enrolled students or the total number of children, the lead of the West would be still further increased.

Table XLII. Percentage of College Students to the Total Population.

Year.	N. A.-Rank.	S. A.-Rank.	S. C.-Rank.	N. C.-Rank.	West.-Rank.
1896-7....	0.135—2	0.093—4	0.080—5	0.131—3	0.172—1
1897-8....	0.140—2	0.097—4	0.081—5	0.139—3	0.181—1
Averages.	0.137—2	0.095—4	0.080—5	0.135—3	0.176—1

Table XLIII shows the distribution of the students in each division among the different branches of higher work. Remembering that the total attendance in higher education comparatively is practically the same in the East and West, it will be seen that the West has the largest attendance in collegiate and technical education, while the superiority of the East in attendance is confined to colleges for women and schools for medicine, law, theology, pharmacy, etc.

Table XLIII. Percentage of Students (1898) in

	N. A.-Rank.	S. A.-Rank.	S. C.-Rank.	N. C.-Rank.	West.-Rank.
College	54.—3	36.—5	46.—4	56.—2	68.—1
Technology ...	6.—4	9.—2	5.—5	7.—3	13.—1
Medicine, Law and Theology	29.—2	28.—3	26.—4	34.—1	17.—5

The above statistics deal with the attendance *in* the division irrespective of the place of residence. A division might lose a large part of its students to increase the attendance of another division. The interest in higher education is more nearly indicated by the number of students *from* a division who attend irrespective of the place, rather than by the number who attend in the division irrespective of the division where they live. The following table gives the percentage of college students each division loses or gains by attending college in some other division other than that in which they reside. Each both gains and loses some students, but the percentages refer to the net loss or gain. The table deals with college attendance alone; the percentages would probably be materially increased for all phases of higher education.

Table XLIV. Percentage of College Students from the Division Lost or Gained.

Year.	N. A.	S. A.	S. C.	N. C.	West.
1896-7....	11.2 gain	1.7 lost	3.5 lost	3.5 lost	3.8 lost
1897-8....	10.3 gain	0.0 lost	5.5 lost	3.6 lost	3.1 lost

The East gains over 10 per cent., while all the others lose in a lesser degree. The relative college attendance was much greater in the West than in the East (XLII), and if we make allowance for a 10 per cent. gain by the East and a 3 per cent. loss by the West, it is easy to see that the relative attendance of college students *from* the West is much greater than from any other section. Since the attendance in all phases of higher education in the division is practically the same for the East and West, the West must stand first in relative attendance *from* the division after making allowance for loss and gain.

Summarizing the matter of attendance, first, in all phases of higher education the West is on a par with any other division in the relative number of students who attend *within* the division, and ranks first in the relative number *from* the division who attend somewhere; second, in collegiate and technical work the West ranks easily first in the relative number who attend both *in* and *from* the division; third, the East has the greater attendance in colleges for women, and in schools of law, theology and medicine.

Table XLV. Value Per Student (1898-9) Attending Colleges and Universities for Men and Women, and Schools of Technology.

	N. A.-Rank.	S. A.-Rank.	S. C.-Rank.	N. C.-Rank.	West.-Rank.
Library	$ 65.—1	45.—3	27.—5	35.—4	49.—2
Scientific Appa's	123.—1	45.—4	39.—5	56.—3	99.—2
Grnds and Bldgs.	978.—1	711.—3	480.—4	473.—5	783.—2
Total income..	$156.—2	142.—3	86.—4	82.—5	160.—1

In the value of the library, scientific apparatus, grounds and buildings per student attending, the East easily leads, with the West second. This, of course, was to be expected where the colleges and universities have been long established; it is the high rank of the West in these respects that is a matter of surprise. A comparison of benefactions has been omitted since the amount has varied from year to year, and it would be very difficult to strike a fair average and also because the money is largely expended in apparatus, buildings and endowment. In the matter of income, the West, however, is first in rank by a small margin.

In regard to the quality of work done no definite statistics are available. However, in the East the students are localized more in a few great universities, so that the same income per student would mean more than in the West, where the students are scattered. The localization of the students in colleges and universities is shown as follows:

Table XLVI. Localization of Students.

	N. A.-Rank.	S. A.-Rank.	S. C.-Rank.	N. C.-Rank.	West.-Rank.
Students per College	382—1	214—5	265—4	335—2	284—3

Although the West has the greatest income per student, yet without doubt the efficiency of this amount per student is nevertheless greater in the East. The same is true regarding the efficiency of the library and scientific apparatus. It is doubtful if the equipment and income bear much relation to the number of students. Almost as much is demanded for a few students as for a comparatively large number. Certainly efficiency is increased by a localization of students and equipment and income in a larger institution, and possibly efficiency is much more nearly indicated by the localization of the students than by the values of equipment and income per student. The significance of the last two tables in regard to efficiency is thus largely a matter of conjecture, though without doubt they are to be construed in favor of the East, with the North and West more nearly on a par.

SUMMARY.

In conclusion the status of the West in education as derived from available statistics may be summarized as follows:

I. Common schools, embracing public elementary and secondary education.

1. First in attendance proportionate to the number of children of school age.
2. First in financial equipment and support proportionate to either population, enrollment or average annual or daily attendance.
3. Second in regularity of attendance.
4. Second in regard to the least enrollment per teacher.
5. Third in length of the school year and the amount of education proportionate to the population, children and enrollment.

II. Secondary education, embracing all phases of secondary work, no matter where done.

1. First in interest manifested.
2. First in the requirements in English and History.
3. First in the average length of the high school course and the standard of work (probable).
4. Second in the distribution of secondary work among the people.
5. Second in financial support and equipment.

III. Higher education, embracing collegiate, university, technical and professional work of all kinds.

1. First in attendance of students *residing* in the division, proportionate to the population, children or total number of students.
2. First in the number *attending* in the division proportionate to the children of school age, although a number attend in the East.
3. First in proportionate number of *collegiate and technical* students attending within the division, irrespective of the fact that over 3 per cent. attend in some other division.
4. Second in financial equipment and support.

Without doubt, the educational status of the West is, at the least, on a par with that of any other section, notwithstanding the fact that it is comparatively a newly settled and developed region, that it stands fifth in density of population, fifth in proportionate number of children, second in localization of population in towns of 4,000 and over, fifth in proportionate number of foreigners, but first in wealth per capita.

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CONTENTS.

SOME RECENT SOCIOLOGICAL VIEWS.

JAMES H. BAKER.

Sociology is the science which considers the fundamental laws of association and the means of social progress. It is thus distinguished from the special problems of human association treated in Economics, Political Science, Ethics, etc. Sociology as a distinct science is comparatively new, but it is increasingly engaging the attention of thinkers and philanthropists and gives promise of large results for human betterment. The theme proposed is a large and difficult one, and calls for a summary of some accepted views with more or less reference to leading writers. It must be understood, however, that the personal equation will enter into the entire treatment of the subject.

PRINCIPLES.

Many theories regarding the basal principle of association have been advanced. We may quote that of Professor Giddings, who finds the original subjective social element to be "consciousness of kind." He thus defines his meaning: "The consciousness of kind is that pleasurable state of mind which includes organic sympathy, the perception of resemblance, conscious or reflective sympathy, affection, and the desire for recognition." Together with the struggle for life appears the social tendency as the struggle for the life of others—the germ of altruism. Instinctive association later becomes conscious and purposeful, and what is called the social mind is developed. Society advances by survival of the fittest ideals and forms of organization.

That society is not a self-shaping organism is now generally admitted. Even Herbert Spencer, after the extensive use which he makes of his device to set forth the organization of society, explains that there are only certain limited analogies between the human and the social organism; and Huxley repudiates the use of such analogies on the ground that the units of society are independent existences. Any exclusive biological doctrine of social evolution appears to be materialistic and fatalistic. It refuses a unique character to the psychic elements of human nature, denies free agency, and leads to the *laissez-faire* view which even today is the worst feature of our civilization. If he who attempts to prove free will is logically insane, he who in real problems denies free agency is practically a fool.

There is a difference between biological laws and human social laws, since society has a moral aim. "Ethics and evolution are as far asunder as the poles." Natural evolution at a certain point becomes "artificial and teleological"—conscious purpose appears as a factor in guiding events.

Professor Ward claims in substance, that psychology alone can explain human society and that the social bond is found in the feelings. Professor Giddings and Professor Baldwin advance similar views.

In substantial agreement with the doctrine of these writers, we ascribe chief importance to the inventions, thoughts and sentiments of individuals who have the power of initiative and leadership. "The matter of social organization is thought; the method in social organization is imitation. Society grows by imitative generalization of the thoughts of individuals." Carlyle's "Heroes and Hero Worship," though presenting an exaggerated view, is a notable recognition of this principle. History furnishes many examples of the power of genius to create public sentiment. "Let who will make the laws of a people, if I write their songs" was uttered with genuine insight.

The principle of struggle and survival in evolution is of course generally accepted; Weismann's principle that acquired traits are not transmissible is accepted by many. The followers of Weismann, like Benjamin Kidd, hold that natural selection must obtain, or society will degenerate. If, they claim, we inherited the mental and moral culture of the past, there might be progress without natural selection; but, if the survival of the best-adapted variations is the only means of progress, then struggle must go on; the race deteriorates if the fit and the unfit have an equal chance to survive; lack of competition would mean biological deterioration and death. This question is of far-reaching importance in all discussion of progress, and, until it is settled, the manner of solving many practical problems must remain in doubt. Certainly the belief in accumulated heredity is widespread, and nothing but scientific demonstration will overthrow it. In the meantime, even if Weismannism be true, the accumulated culture of the race is transmissible from generation to generation through education, and this fact strengthens the faith of the optimist.

In passing we may refer to another important view, as held by Benjamin Kidd. He teaches that reason is selfish, and that by itself it serves to intensify the struggle. This view is of course disputed. Professor Ward says that civilization has advanced through will and intellect; that the intellectual faculty, superseding biological evolution, rapidly adapts the environment to man, and does away with brutal selfishness; that the intuitive reason desires not the harm of others. It is difficult to compare views because of the different meanings attached to terms by different writers, but reason in its full sense must recognize the principle of altruism, must know that rich individual growth includes social desires and aims, and must perceive the rational and divine order of the world.

We grant there must be struggle in some form, but even Kidd recognizes there must be another principle to make civilized society possible. He brings in the power and sanction of religion, as the necessary altruistic influence. The rational selfishness of individuals is the disintegrating influence; religious belief provides a sanction for social conduct; the first must constantly be subordinated to the second. He believes evolution teaches that the race must continue to grow more and more religious. He believes that in an improved religion we shall conquer; we may add that the victory will be easier and more complete because of an improved science.

One conclusion is justified, namely, that social progress can not rely upon natural selection alone, but must bring to its aid all the forces of material and physical betterment, of public opinion, law, morality and religion.

MEANS OF PROGRESS.

CHARACTER OF THE PEOPLE.

A century ago "*laissez-faire*" was the cry of economists and "natural rights" the means to cure social ills. Today ethical principles and co-operation enter into the discussion of social and economic questions. John Stuart Mill moralized Political Economy. He showed broad sympathy with the masses and exerted a powerful influence upon all political thought. Men like Carlyle, Ruskin and Tolstoy have popularized and spread ideas making man more than an economic member of the State. Christianity, just coming to full consciousness of its mission, inaugurates humane movements for the cure of social ills. Judging by some recent tendencies even wealth is beginning to see the necessity of some kind of ethical code.

According to a principle previously noted, the individual furnishes the material for progress, and individual responsibility is to be determined in the light of that principle. Those who are natural leaders have the larger duty. There will always be distinctions in society, and this is as desirable as it is inevitable. Since the many will accept the guidance of the few, the good citizen will always be ready to make some reasonable sacrifice for the public good. Avoidance of this duty is the worst of our evils. The active interest of intelligent citizens is the only efficient and final check on official neglect and abuse; the safety of democracy depends on a healthy public sentiment. Progress cannot come through struggle alone; its trend must be ideal, social and ethical.

Biology, psychology, history show that, if man is selfish, he is also pre-eminently social. Spite of all the existing evils of government, the governments of civilized nations are being made the instruments through which the will of the people finds expression. Democratic government is the servant of the people; the will of the people can control its character and its tendencies; it is the necessary machinery for bringing about many reforms; and a people who have not the virtue and active energy to effect reforms through government are incapable of accomplishing them through any other organization of society or lack of organization. I have always held the view that the forces working in the world are the forces of progress. Carroll D. Wright closes his volume on "Practical Sociology" with a most hopeful view. He claims that as a result of the human struggle we have a new man, a new political economy, a new state—the kingdom of Christ on Earth, a new religion—that of progress, and a coming "revival of a religion which shall hold in its power the church, industry, commerce, and the whole social fabric."

Spencer of course believes in the natural evolution of institutions and he makes a long list of the products of civilization that have developed by natural process, without government interference, or indeed in spite of interference. He thinks there must always be a higher and a lower in society. Whatever view we may take of his decentralization doctrine, he is undoubtedly correct in claiming that the form of political institutions is less important than the nature of the citizens. The character of the units makes the character of the aggregate. Political institutions may not be modified faster than the character of the citi-

zens is changed. France and America furnish illustration of this fact. The hope of progress is not in legislation but in character. We hope, and I think may believe, that Spencer is right in his Utopian view. "The ultimate man will be one whose private requirements coincide with public ones. He will be that manner of man who, in spontaneously fulfilling his own nature, incidentally performs the functions of a social unit; and yet is only enabled so to fulfill his own nature by all others doing the like."

Individual responsibility in social reform can not be too strongly urged. *Laissez-faire* is materialism, fatalism, selfishness, savagery, indifference, laziness, mere subjective religious life and Pharisaism. It is the Priest and the Levite and not the Samaritan.

EDUCATION.

Whether Weismann's view or Spencer's of heredity be true, we may be sure that wide-spread education pays, because the accumulated traditions and stores of knowledge are transmissible, if not by heredity, then at least by education and the social atmosphere. Giddings says "States should assume cultural functions. The members of the state see that social cohesion is a spiritual union rather than an external compulsion, and that it depends upon the ideas of individuals. They believe it to be as necessary to guide the minds of men as it is to suppress crime and insurrection. Rightly or wrongly, they believe also that the guidance will be inadequate or pernicious unless the state itself is the supreme guide." He notes some twelve modes of equality, a sense of which he regards as necessary for the safety and success of democracy, and he argues that a sense of these equalities can be established only by an efficient public school system.

RELIGION.

Another force for progress is religion. Even Herbert Spencer concedes there is a great truth running through the whole history of religious thought and feeling, namely, the belief in unseen causes. He believes that religion will still and ever possess the minds of men, though modified in doctrine to harmonize with the best universal instincts of human nature. The press from time to time heralds the beginning of movements in Germany, England and America looking toward a broad religious philosophy, and spiritual life abounding in good works. The churches are adapting themselves to new interpretations in accord with the growing conception of truth and are meeting new demands for practical Christianity. We may believe religion will still be the dominant influence toward ideal and altruistic living, and that Kidd's theoretical need of religion as a socializing force will be met in fact.

THE STATE.

There are two extreme tendencies of society,—individualistic and socialistic. Each tendency, besides containing a selfish element, looks toward bettering human conditions.

Individualists are opposed to state interference. Individualism developed from the Fifteenth to the Nineteenth centuries as a movement toward religious and political freedom. The later development of individualism is economic.

Adam Smith, the great political economist, was an individualist. Individualists argue that individualistic countries are the most progressive; that regulative legislation is always faulty; that dependence upon the state weakens the people and lowers the social level; and that socialism is the negation of freedom. Spencer is a strong advocate of individualism. He claims that, while benefit according to incapacity and need is the principle ruling in the family, the relation of the state to the citizen must be governed by the principle of reward according to merit; that by competition the quality of the species is preserved. He objects to the disintegration of the family and the too ready assumption by the state of responsibility for children.

On the other hand Kidd uses evolution in favor of state interference, and Huxley uses biology to the same end. Socialists use evolution to show the necessity of organic social life without competition.

The aim of socialists is not at paternal or state control, but at the gradual co-operative reorganization of society through government. They are neither revolutionary nor anarchistic. There are other types of socialists; but in England, America and Germany, the term is commonly applied as above noted.

Socialists claim that the co-operative state would bring individual freedom instead of servitude of labor to capital; would tend to the survival of the best instead of the strongest, and would make good character.

Spencer says that, while there must be sympathy enough to mitigate ills without helping the worst to multiply, there must be no communistic distribution equalizing good and bad, but must always be private ownership of things produced by labor. The German socialists under the militant idea want to establish merely a new form of coercion and regulation. He cites the ancient Peruvian Empire with its detailed military organization. He argues that, while spontaneous sympathy will bring an average of benefit, in the social state society would perish; parental instinct would disappear. Human nature is not fitted to the social state, is too selfish. The officers of such a state would be corrupt.

John Rae takes a similar view. Socialism intent on diffusion of progress fails to see that it would cut the springs of progress. Incentives to production and energy of effort would be relaxed. Human nature would take its ease. There would be diminution of production, increase of population, industrial slavery. Freedom would disappear under another form of absolute government. Military despotism would be better.

Between these extreme views there is a golden mean. We may dismiss anarchism and revolutionary socialism at the outset. Even if in a distant age government control can be largely relaxed, abolition of government today, human nature being as it is, would necessitate the gradual re-establishment of government through a chaos and struggle which would be a repetition of Middle-Ages history. Did we have the social state to-day, human nature being what it is, we should have under another form of organization an exaggeration of all the political corruption and selfishness and weakness which exist under present forms of government. In all civilized countries political changes will be an evolution and not a revolution. We may throw aside all supposed absolute rights and inflexible principles. Let the state do what it can do better than individuals. Gid-

dings says that normal evolution is neither individualistic nor socialistic; that the distribution of functions between public and private agencies is a varying one; that we can gain and maintain liberty through government. John Rae believes in extending the sphere of the state. Kidd thinks that, while state management is not desirable, state regulation and control will be extended in the interest of free competition. John Rae holds that *laissez-faire* is no longer a living faith; that the state cannot divest itself of a distinct social mission; that state functions do not interfere with individualism; that the state may be a social reformer without being socialistic. Huxley believes in state functions. Ward expresses his views somewhat in this fashion: Plutocrats cry *laissez-faire* and create fear of government and advocate individualism. He thinks unequal distribution worse than all the evils government can commit. The individual has ruled long enough; society must govern its own affairs. Sociocracy is the ideal aim. Sociocracy recognizes all forms of government, but holds it to be the duty of society to guard its own interests and work out its destiny. It is the art of applying the active forces of society to society's problems. When the people govern their own affairs instead of leaving them to party machines all issues irrelevant to the real question will be laid aside. What is called the natural does not rule in the affairs of men. The artificial is infinitely superior to the natural. Government is artificial and can be changed according to progressive ideas whenever intelligent and moral leadership desires.

The tendency today is toward more government control and, I believe, rightly. Though many of society's ills must be treated by government instrumentality, yet, when the cure is effected, there may properly be a reaction toward individualism. The abuse of monopoly, the evils of poverty and degeneracy must be met in the immediate future by extension of governmental functions. Charles Booth uses the phrase "socialism in the arms of individualism," and it is a very significant phrase.

ECONOMICS.

POVERTY.

We must acknowledge that the sociological problem as related to poverty is startling and difficult, and calls for an earnest attempt at solution.

The cry of some extremists is that the rich are growing richer and the poor poorer. The former may be true, but not the latter. This is demonstrated by Carroll D. Wright in his "Practical Sociology." He shows that in 1891 the purchasing power of a day's labor was in the proportion of 168 to 100 greater than the purchasing power in 1860. He claims that the effect of machinery, saving the incidental readjustment of labor, has been in every way beneficial.

The causes of poverty are hard to determine with accuracy because of the varying conditions for every set of statistics, and the personal equation of statisticians. Some say lack of work, insufficient work and poorly paid work added together are the supreme causes of poverty; that capitalists get too great a share; that misfortune and not misconduct accounts for much the larger amount of poverty. Individualists say, inefficiency of the poor, shiftlessness, lack of thrift, prodigality, etc., are prominent causes. One important table makes an average,

taken from three large cities, of causes of poverty of applicants to certain charity organization societies. Prominent causes in the order of their percentage are as follows: (1) Sickness, accident or death; (2) lack of employment, not due to the employee; (3) intemperance; (4) lack of thrift, industry and judgment.

To meet the problems of the unemployed a Massachusetts commission suggests, among other things, (1) removal to farms; (2) industrial education; (3) state public works in winter; (4) state labor colonies. These remedies are socialistic in character. Individualists recommend manual training, temperance, thrift, etc. Wright suggests these remedies for social disorders, but they may apply, in part, specifically to the problem of poverty: (1) trade, technical and manual training; (2) justice to labor; (3) equitable distribution which must come under some system without resorting to socialism which is revolution; (4) prison instruction in trades; (5) moral law in business relations.

Certainly we must recognize many causes of poverty. It is harmful to make a hobby of any one theory, or to try to find a panacea in any one remedy. Unwillingness may be subject to state regulation; lack of thrift, prodigality, etc., may be modified by philanthropic endeavor; inability can be removed in a percentage of cases by education and by the influence of such work as that of the "settlements;" lack of opportunity for work can be met in part in times of distress by state or municipal provision for needed public improvements; various kinds of misfortune should be met by state provision and organized philanthropy; hopeless pauperism should be the state's care; inequitable distribution will be gradually modified by labor organizations and the development of altruistic principles in society. There is much of poverty that no plan of state or society can remove until the tone of the whole social organism is improved. I refer to the lack of aims and motives in those who are otherwise physically and mentally capable. The world is full of opportunities for establishing in thousands of centers productive industrial activities, if the unemployed had the power of initiative. This whole subject is related to the problem of degeneracy.

MONOPOLY.

The problem of industrial combinations is a growing one and it enters into the whole question of human relations, social and governmental. Some believe that there are natural limits to combinations: limited fields for additional enterprises; regulative power of demand as related to price and quality; the selfishness of the people who resent injury; the sense of justice of the people. Others hold that monopolies are not necessarily evil, but the inevitable accompaniment of our new civilization.

That monopolies, so far as harmful in fact and tendency, should be subject to control is, I believe, the growing theory. The findings of the United States Industrial Commission, which has recently finished its labors, are significant, especially as the commission cannot be charged *a priori* with undue hostility to wealth. Regarding railroads the commission recommend for discrimination and other evils: (1) That government control be strengthened and that the authority of the Interstate Commission be restored and its functions be enlarged; (2) that for effectiveness the Commission should be representative of various interests; (3)

that capitalization and financiering of railroads should be regulated by legislation; (4) that discrimination in favor of imports be prohibited. Regarding industrial combinations they recommend, amongst other things: Publicity; prosecution for violation of federal anti-trust laws; national and state laws against discrimination between customers; laws concerning over-capitalization and to furnish state supervision; federal taxation and supervision; tariff modifications as related to the evils of monopolies; investigation of the whole question of import duties.

These findings show the need of control through government, and the belief in its possibility and feasibility. Moreover, the very fact of the report shows that specialists, statesmen and even politicians and monopolists are awake to the fact that reform must come.

TAXATION.

Taxation is another interest that is related to the problems of altruism. The Industrial Commission advocate: (1) that states raise their revenue from corporations, inheritances and incomes, supplemented, when necessary, by indirect taxation—the taxation for local purposes remaining on real estate and personalty; (2) that corporations be taxed on the value of their franchises, based on actual value of stocks and bonded debts, less value of real estate assessed locally; (3) that states levy graduated taxes on inheritances; (4) that the state establish a graduated tax on incomes; (5) that there be special taxes upon any business not otherwise made to bear its just share.

Professor Seligman, who is one of the progressive writers on taxation, says tax is to correspond as far as possible to revenue of citizens. Citizens should support government according to their capacity to support themselves. Revenue or income is now regarded as the ideal basis for taxation. He advocates as a present policy the inheritance tax, and the corporation tax for state purposes.

DEGENERACY.

In spite of certain biological doctrines of social evolution, in spite of the advocates of struggle, in spite of all *laissez-faire* theories, one important fact must be recognized—namely, that human sympathy is growing and that human sympathy must be preserved in all its strength and purity; it is the bond that unites the units into a social aggregate. At the same time it is conceded by all scientific philanthropists that, as struggle is modified by altruism, the unfit of every description are preserved to the detriment of the race as a whole, and that some humane solution of the difficulty must be sought. The burden of the stàte is becoming such that the causes of degeneracy must be in large part removed. The very fact that state and society are assuming the care of the unfortunate shows the growth of altruism and a recognition of the solidarity of society. The dependent, defective, and delinquent classes are beginning to receive attention and study commensurate with the importance of their effect upon the welfare of the whole social fabric. Since all degeneracy is due to heredity or environment, state and society can reach, and to some extent regulate, the causes. Sociology is becoming an important subject of study in institutions of learning;

in institutions for the care of wards of the state experiments are conducted with the desire to discover practical principles for care, education and reformation. State and national conferences are comparing results of practical experience. Every city counts its philanthropic organizations by the dozen, and organized charities are doing with wisdom and efficiency what formerly was done by unwise and harmful spontaneous charity.

The economic organization of society as related to the class of dependents has already been discussed. Dependents who are able but ignorant or unwilling must be reached by education, and by all influences that will awaken the dormant impulses to right activity. There are thousands of splendid men and women who need sympathy, encouragement and guidance, and in some cities the chief work of charity organizations is not alms-giving, but developing a self-respecting, self-active personality. The class of dependents who are born paupers, hopeless in ability and motive, should at once become the care of the state, and the sexes should be permanently segregated.

The defectives, on humane and economic grounds, should be educated, each according to his capacity, and the hopelessly incapable should remain under institutional care, the sexes being separated.

The class of delinquents furnish greater problems than other defectives. Criminals as a whole are likely to possess physical anomalies, physical degeneracy, and a humbly developed mental organization. Children with these traits often become criminal because of social conditions; they do not readily find employment and easily turn to evil ways. Those born with criminal taint usually inherit it from some form of degeneracy in parents. With good environment, however, many of these may become good citizens. Poor homes, bad surroundings, lack of education and occupation may make criminals of normal children. It is shown that a large percentage of criminals have no trade. One table of statistics shows that only six per cent of inmates in the Elmira Reformatory had good homes. The home is the starting place for all sorts of reforms. Practical sociologists today deplore the tendency to disintegrate the family, and whenever possible endeavor to preserve its integrity and keep children within its fostering influence. For care of dependent children, homes are preferred to institutions. Of course, industrial and other education for all neglected children is nearly the panacea. Children with positive and exaggerated native criminal tendencies, whose offspring could but be degenerates, should at an early age be placed under custodial care.

In the treatment of criminals, belief in the indeterminate sentence is growing. The first work of prisons is reformation. When a criminal is reformed and has been taught an honest trade he is ready to be released; if he is a hopeless criminal by nature, he never should be restored to society. So far as possible prisoners should be made self-supporting. It is an anomaly that able-bodied criminals should be supported in idleness by good citizens.

Since the struggle in human society is bound to be lessened, and race deterioration will surely follow unless degenerate tendencies are eliminated, what is the aspect of the problem? Society will no longer allow the unfortunate to perish. The answer seems to me plain and simple. Dickens, in his marvelous study of

social problems, emphasized with terrible vividness the evils of society from neglected children, when these should become grown and trained in vice and hence powerful for harm. The work of improving the lower strata of society must begin with children. Educate the normal children of the poor, teach them some trade and start them right in life. Educate all who, under right influences and training, can become useful citizens. Remove waifs from unwholesome surroundings, or rather improve the surroundings. But in the name of humanity place all those who by nature must become hopeless paupers, imbeciles, all who by nature will become hopeless criminals under permanent custodial care. Teach them some simple occupation and make them in part self-supporting. Segregate the sexes that such unfortunates and society may be spared the fatal gift of degenerate offspring. This will do more to regenerate society than use-inheritance and all remedies proposed, except the great moral evolution of the race as a whole, which I believe is going on. To those not acquainted with recent views and experiments, some of these propositions may seem chimerical. But in some states already imbeciles, epileptics, etc., are colonized and the sexes are segregated. The members of these institutions, or colonies, are given some light occupation and are made comfortable—better off than they would be under greater freedom. This method is humane, is practicable, and its use is a common-sense duty. I predict that so far as scientific investigation shall determine—not inconsistently with proper sympathy—this method of decreasing degenerate elements of society will be employed. The radical method proposed by some medical men of putting all the unfit to painless death will never be employed—it would destroy human sympathy; besides, too many of us would be in danger. The plan in operation would produce a French-Revolution frenzy of destruction. All reforms are possibly by conservative, wise and humane methods.

THE FUTURE.

Altruism is growing; philanthropy is becoming scientific and practical. Are poverty, degeneracy and crime decreasing? Probably we are at too early a stage of practical investigation to draw definite conclusions; but we feel certain that science under the inspiration of altruism will discover the means for reducing all the evils from which society suffers.

RECENT ESSAYS BEARING ON THE SOCIAL IN EDUCATION.

HARVEY A. CARR.

In times past, education was largely a family or parental function. The family, present and future, was the corporate survival unit in conscious educational activity. Formal education was individualistic in tendency; as to aims, it centered around the child—its success, happiness and development. Many definitions of the aims of education still embody this personal, parental attitude; they entirely face the child with no glance over the shoulder at social ideals and tendencies—as to where the journey tends; they emphasize individual acquirements—power, character, culture, complete development, etc., etc.

Education is evolving from parental to social care, from a family to a state function. On the one hand the family has gradually surrendered the function, as society performs it better, and on the other society has tended to usurp the office as corporate consciousness and the spirit of democracy have arisen. The aim of education becomes objective or social. Society demands that certain ends be attained. The young must be fitted as members of the social corporation. The particular end changes with varying emphasis; at one time the political consciousness is dominant and training for citizenship is demanded, the industrial with its requirements, or the social with its demand for an ethical and social character, but the aim is social or objective. The idea has been further accentuated by historical studies of educational systems, and by biological and sociological theories with their emphasis upon adaptation to existing conditions as the keynote of success.

With the industrial ideal has come science, technical, trade and manual-training schools, specialization, electives, readjustments of the curriculum, demands for shorter courses, etc. The tendency has been illiberal and utilitarian to some extent, a somewhat mechanical adaptation to the social regime, a training to fit the individual as a mere wheel in a complex interacting system.

With the rise of democratic self-consciousness, the ideal becomes more liberal in nature. The essence of democracy is to superadd to a mechanical arrangement a psychic relationship—a conscious partnership in the social corporation. The social aim of education arises wherein the aim is to educate the young as conscious partners, rather than as mere clerks or laborers. Social participation and social self-consciousness is the ideal. The old industrial and political ideals are not destroyed; a new one is added. The curriculum and the various branches must be remodeled with a social reference, the child must be conscious of their bearing and relation to present progress. All roads now lead to the "new Rome." Social industries and institutions pervade the school, furnishing educational material to incite an interest in and understanding of the real active

world round about. An intimate connection between the school and society must be established. The social spirit of conscious coöperation is fostered by the organization of the school into a conscious corporate body that finds unity of action in self-government, on the playground, through athletics, care and decoration of grounds and buildings, and a multitude of other corporate activities. To a training for life is added the celebrated dictum that "education is life." From the old parental ideals, education has evolved until now *it is a training by, for and through social activities and relationships.*

Various phases of these lines of thought have been strongly emphasized in recent educational writings. G. Stanley Hall has a most excellent article on "Some Social Aspects of Education" in the *Pedagogical Seminary.*

He summarizes the position of sociology in its adverse criticisms to present-day educational practice: Man is a social being, and when isolated from society tends to imbecility and one-sided development. Social interaction is thus markedly educative and the social spirit, social activities and relationships should enter into and pervade the school. In view of these principles the following criticisms are urged: Education is too individualistic, the child is isolated from the home and from nature; education being conservative, like all institutions, the curriculum looks to the past rather than to the present; the curriculum is rigid and non-adaptable to varying personalities; form is emphasized rather than context; science is abstract and unrelated to living nature; present-day current questions appealing to live social interests, such as religion, politics, etc., are ejected from the school because of divergence of public opinion; instruction and work is individual, allowing of no mutual help, coöperation or emulation on the part of the pupils; there is but little correlation of branches; the parts of the whole system are not articulated, with consequent gaps, overlappings and waste; and the grades are isolated, making promotion difficult and interaction of grades impossible.

President Hall admits these indictments to some extent, but considers them too sweeping and somewhat exaggerated. There are certain tendencies in these directions, but critics fail to see on the other side social tendencies already at work, and which may be further utilized by judicious management for the improvement of present conditions. These social instruments and means he briefly mentions: 1st. Language is a social instrument, and its very use necessitates social interaction, communication, and experience; 2d. Imitation is primarily a social activity whose force and extent are much greater than commonly supposed. It necessitates interaction and communication; 3d. The school may be organized as a social unit whose corporate activity may be expressed in various ways as decoration and improvements of grounds and buildings, etc.; 4th. Self-government may be initiated; 5th. The socializing effect of group-games and of the playground in general may be extended; 6th. A greater connection between the home and the school may be made through home activities; 7th. Nature study may link the school with every-day surroundings; 8th. Social, political, ethical and philanthropic agencies in their actual concrete workings may be studied; and 9th. The same may be done of the social industries of the immediate environment.

With the advent of adolescence President Hall advocates a change of locus from society to the individual. Training of the pupil in individuality and not for social ends is to be emphasized. Society must fit personality and not *vice versa*. Culture and a wide general knowledge must take precedence over specialized training. Educational methods must look toward, not the present, but the future society through a full and wide development of the individual. (1)

An interesting and instructive attempt to unite more closely for mutual interaction the school and society in the Greenleaf Public School of Washington, D. C., is described by Sanford Bell. (2) The work was conceived and carried out by Principal Riordon of one of the regular ward schools in the poorest section of the city. A school garden five feet in width and skirting the inside of the school yard fence gives expression to the conscious corporate activity of the school. The entire work is done by the children, community activity and ownership lasting till harvest time. Flowers and vegetables are raised which are divided and used in the school. The children voluntarily keep off the garden in their play.

Two courts of sixty feet square were improved and fitted up by the children for playgrounds. They are shaded by awnings and are provided with swings, seesaws, benches, sand piles, gymnastic apparatus, etc. All improvements were made or purchased by the children and belong to them as a community. Disciplining is left as much as possible to them. These grounds are used before and after school hours and on Saturdays.

A monthly paper is edited and published by the pupils and a savings bank, paying interest on deposits, is also officered and managed by them.

The manual training consists as much as possible of the necessary industrial activities of the school community. The girls take care of the halls and recitation rooms as to cleanliness and decoration; actual accounting and bookkeeping are necessary; reports, programmes and announcements are typewritten and copied on a mimeograph; telephones and electric bells are put in and kept in repair; actual painting and carpentry are taught, the buildings being thus kept in constant repair.

A vacation school was established; the morning hours being devoted to a variety and combination of academic and industrial work, and the afternoon to the playground, with an hour's programme of music, recitations, etc. Saturdays were used for country excursions. The afternoons were open to the parents, and members of the professions and trades gave simple talks on their respective industrial activities.

Miss Jane Addams, in her book on "Democracy and Social Ethics" (3), has a chapter on Educational Methods, in which she deals very sanely and sympathetically with current educational practices in relation to the social needs of

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(1) G. Stanley Hall, Some Social Aspects of Education, Pedagogical Seminary, Vol. IX, No. 1, pp. 81-93.

(2) Sanford Bell, An Educational Object Lesson, Pedagogical Seminary, Vol. IX, No. 2, pp. 237-248.

(3) Jane Addams, Democracy and Social Ethics, Chap. VI, pp. 178-220. MacMillan & Co., 1902.

See also Prince Kropotkin, Mutual Aid, London, 1902.

urban industrialism. Her views are the result of long experience with the actual conditions in the Hull House Settlement and are of inestimable value to either the theoretical or the practical educator who is earnestly attempting to adapt the educational institution to the rapidly evolving social conditions.

Miss Addams shows well that the essence of democracy is to educate each individual into the corporate consciousness of the evolving society; that democracy includes all of the body politic and that social progress depends upon bringing each member into, not mechanical, but conscious relationship to the whole; each must be not a silent, mechanical, but a conscious dynamic integer; a conscious co-partner of the great corporation.

In view of this Miss Addams characterizes present learning and training as too individualistic in that it fits too exclusively for individual or family success and neglects that knowledge which gives social value and meaning to the daily experience of the industrial laborer. As a case in point, she pictures an Italian colony in their relation to the educational system. They were mostly peasants in Italy and in the family industrial stage with its diversified activities for the whole family. Here their whole industrial life is changed. The father works in a factory, the mother's home work is very limited in comparison to her former outdoor and domestic activities. The child has comparatively little to learn from his parents that will put him in touch with surrounding industrial and social conditions.

The school in no way utilizes the child's language, his habits of mind and body or his social traditions; the school has no power or attraction for him whatsoever. It is but natural that he should leave school and enter a factory at 14, or take to selling papers or the life of the street at an earlier age. The knowledge gained in school in no way relates to his future occupation or daily experience; it is commercial or professional in tendency, in that it is clerical in nature; it is associated with a rise in life and away from trade and industry; it has no relation to productive industry and the industrial worker. Business colleges also emphasize the clerical part of commercialism and do not minister to the factory employee. The same is true of university extension and settlement work; it is bookish, academic and divorced from their actual life and experience; it appeals to a few of the academic type, but leaves the mass untouched. Industrial education has attempted the problem, but has failed, in that it has trained experts—engineers, chemists, electricians, machine builders, etc.—rather than educated machine tenders; it has raised but a few to a higher position, but has done nothing to improve those who remain laborers.

The dehumanizing effects of the machine monotony that results from specialization and division of labor must be overcome. According to Miss Addams this can be done by giving the workman some conception of the evolution of his industry in its relation to social and industrial progress. Machines and processes have their evolution, their growth, their historic associations with human progress as do ancient buildings or ruins. We inject the "doing of life" into education and we should also surround the "doing of life" with education, give life and meaning to the workman's activities. The interdependence of society must be more than mechanical—a conscious, psychic affair. The historical evolution of

industry, of the machines, processes and the worker, in its relation to the unity of purpose in an evolving society would serve to orientate the worker and to evaluate his position in reference to the whole.

President Hall (1) in an article in the Pedagogical Seminary characterizes briefly three attitudes or aims that have or may obtain in an educational system: 1st. The training of the old schools which looked largely to the past for its ideals. This is the natural tendency of every system in that an evolving society continually outgrows a conservative institution. 2nd. The training that aims to fit for present social conditions. Efficiency in present social, political and industrial activity is the keynote. Standards are fixed and defined and hence the training with this ideal tends to become illiberal. The child is subordinated to social demands. 3rd. The training that looks forward to the world to be, for the next stage of development. Society is changing rapidly and unless we aim ahead we train children after the fashion of the man who was born an hour too late. It aims for future projected efficiency and is both liberal and specialized in nature.

This last phase of the subject is well and thoroughly treated by Prof. Allin in an article (2) in the Journal of Pedagogy. Prof. Allin shows convincingly that the educative process is part and parcel of a general biological and social law which he terms "The Law of Future Specific and Social Efficiency." This law is that natural selection has reference more to the future welfare of the species than to present survival.

The attempt is made to prove that in the organic life of the past only those species have survived the actions of whose members were conducive to propagation of and the best provision possible for the young. The young have been the goal and heirs of all efforts, directly or indirectly.

"One of the most striking, and yet at the same time one of the least observed, facts about specific action is the pre-eminence of the specific as such. The individual is secondary to the species. Instincts, which are characteristically the grand trunk line of transmission and continuity in the lower orders of the zoölogical series, are peculiar and very important in this, that they are always in their origin and bloom for the benefit of the *species* to which the animal may belong which possesses the instinct. They are of benefit to the individual only secondarily, in so far as that individual may be of benefit to the species. The mother gives up her life for the child. She dies, but the child, and through it the species, lives. The salmon struggles up the Columbia river for a thousand miles, is torn and battered by the rocks and waterfalls on the long and weary journey, lays its eggs, and dies; but the race lives on, although at the loss and sacrifice of one of its best members. The long history of the mammalia or *mothers* is a record of innumerable such examples. Of course, it is not necessarily true that the individual performs an instinctive act *in order that* the species may be benefited, but the persistent fact

(1) G. S. Hall, The High School as the People's College *versus* the Fitting School, Pedagogical Seminary, Vol. IX:1, pp. 63-74.

(2) Arthur Allin, The Law of Future Specific and Social Efficiency, Journal of Pedagogy, Dec., 1902 (Syracuse, N. Y.), pp. 119-127.

See also an article by the same author on The Basis of Sociality in the American Journal of Sociology, Vol. VIII, No. 1, July, 1902.

remains that in the long run only those species and individuals survive which act in such a way that the species may be further propagated. Instincts are always for species or race preservation. They are specific, altruistic, other-regarding, profoundly social. They may not be all consciously such, but in their origin and bloom they are in their final import intensely social. It is a question of survival. It is a question of propagation and of the safety and welfare of the propagated. The individuals of a species which do not propagate obviously nullify the probability of like descendants. That which militates against the species thereby militates against the survival of the members of that species. The species that survives is characterized by the fact that its members act in such a manner that descendants are provided, and also provided *for* in some way or other. The goal of their activities is the young and their welfare. The young are heirs of all efforts, directly or indirectly (*Erziehung, eine Fortsetzung der Erzeugung*). In the highest mammalian species, man, art, religion and science are, in the long run, directly or indirectly means for more certain perpetuation of the species and the more certain welfare of the same. The rank of a species is determined by the degree of such care for the young. The survival of the fittest means the survival of the parental, and all efforts are to be judged according to a parental standard. The greatest good to the greatest number must also be interpreted in a similar manner, not as the greatest happiness of the greatest number, but as such parental conduct, direct or indirect, as will be most conducive to the propagation and welfare of the species."

That species or society persists in which there is progressive adaptation of each successive generation. Natural selection implies progress or greater adaptation. Without provision for the future the species must die.

As instances, Prof. Allin cites the parental care of the mammalia where the life of the mother is sacrificed for the future welfare of the species through her progeny, and Weismann's argument that the duration of life itself is determined by natural selection, being conditioned upon the time necessary for propagation of and provision for the young; that the life and survival of the individual is of value only as it secures the further evolution of the species by propagation and education. Hence in the long run natural selection and evolution face the future rather than the present. The law is inherent in the very concept of progressive evolution, for selection must provide in one generation a basis for a better adjustment in the progeny. Increasing plasticity, parental care and education are cases in point.

Of course this process is not necessarily conscious on the part of the individual or society. The result may be attained, no matter what the motive may be, as is instanced by the worldly ambition and money getting of parents. The motive may be selfish or sordid, but the fact remains there is better provision for their progeny. However the majority of parents desire to give their children better opportunities than they themselves had. Dr. Allin instances the growth of paternalism in the state, municipal improvements on a large scale, transisthmian canals, national irrigation, transcontinental railroads, protection of industries, and other large enterprises of society which minister more to the future than to the present. It is but a continuance of the biological fact of increasing provision

for the young and represents the dominant tendency in social progress. "Society," he says, "is not composed (merely) of those now living; it represents the living as the servants of posterity," a saying which embodies the very essence of the social institution of education in that it is an outgrowth of parental care.

The present ideal of education is the adaptation of the young into the present social fabric, a training for existing needs and demands as though society represented static and fixed conditions. This emphasizes unduly narrow specialization. Education must be this and more; it must also have an eye to the future and emphasize those conditions which will allow of continual adaptation in a changing evolving society; it must both survey the present, and chart the future.

How this has been done in the past or is to be accomplished in the future Dr. Allin does not, say. The law is merely stated in its bearing upon a proper educational ideal.

THE ENGLISH EDUCATION ACT.

M. F. LIBBY

The London *Times* of December, 1902, publishes the new education act in full. The English *Journal of Education* of April, 1902, gives a clear abstract of the act. This journal published the act in full, but before it had been debated, and hence not in its final amended form. The debates are to be found in a sufficiently complete form in *The Times*. The leading speeches, outside the house, by Balfour, Rosebery, Sir John Gorst, Chamberlain, the Duke of Devonshire, and others, are given in all the English papers. The letters between Dr. Clifford and Mr. Balfour can be had in the form of campaign literature. By a study of these sources and of the English periodicals one can form some opinion of the nature of this latest pitched battle between National Education and Established Church Education in England.

Mr. Balfour protests that this bill is a great triumph for National Education, in spite of the fact that it pleases the church party. But the non-conformists do not shout for this alleged triumph of theirs. On the other hand they call the act "The Bishop's Bill." Certainly the Conservatives are practically all Episcopalians. The bill was carried in crucial divisions by a majority of 170. Seldom has there been a great parliamentary struggle over an act which was eventually passed by such a majority.

The object of this paper is to give a mere but clear sketch of the whole situation.

From Elizabeth's reign until the 18th century free grammar schools provided all education for the English proletariat. In 1698 these had decayed through crowding of the population into towns. The "Society for Promoting Christian Knowledge" then founded 1,000 schools. In the beginning of the 19th century we find two rival societies carrying on this work—one favoring ecclesiastical management, the other state control. From 1830, a memorable year, to 1870, we find incessant struggles between the societies, concerning government grants, appointment of inspectors and other questions. Between 1833 and 1858 the expenditure by government and municipalities had increased from twenty thousand to seven hundred thousand pounds. From the days of the Duke of Newcastle and Mr. Lowe to 1870 the system of paying teachers by results (examinations of individual pupils) gave some steadiness to the system, which, however, was unsatisfactory, especially to the new liberal democracy.

The English regard the act of 1870 as a compromise between the church and squire on the one hand, and the liberals and non-Conformists on the other. It did a great deal for national secular education similar to the American system, but it recognized the church schools and subsidized them out of the public purse; not directly from the rates, but indirectly from the parliamentary exchequer. This

act established school boards and gave them the power to see that all children got some education, but of course not to interfere with children educated by the church schools. The cost of board schools was defrayed by parliament, fees, and direct tax on every householder in the district; while church schools were supported by their own supporters and by the exchequer at London.

The board schools had been efficient and were gradually but surely gaining on the church schools. The board schools have been denounced as "godless schools." But as the Methodists and Baptists and Independents and other non-Conformists were their chief supporters these denunciations have not alarmed the English people outside the established and the Roman Catholic churches.

Shortly after the brief successes of Lord Roberts in South Africa the Conservatives went to the country and were returned with an overwhelming majority. It is freely asserted that the church compelled the government to use this majority, for which they claimed much credit, in passing a new act which would rescue the church schools from impending ruin. Neither Mr. Balfour nor Mr. Chamberlain is inclined to reaction. The act honestly does all it can to advance education, but it cannot do much in the present juncture.

The salient features of the new act are these: The boards are abolished; new "*local authorities*" are established and are *entirely elective*, being in reality the county councils. These appoint managers for the schools, but these managers, in the case of the church schools, must be nearly all church representatives. *The church schools are to draw on the rates.* The managers hire and dismiss the teachers.

This arrangement seems incredible to us in America, but the first part of this paper explains it.

To the calm outsider the bill is a fairly just compromise, somewhat favorable to the church party, as is shown by the simple fact that all the church people and the House of Lords supported it strenuously, while the Liberals and non-Conformists seem to find in opposing it a sincere ground of reunion. This argument is tempered by the ever-present fact of party politics, by which the opposition oppose the government.

Mr. Balfour says, with his air of philosophic aloofness, that the bill will work well for National Education. The astute Chamberlain told his constituents that if they turned out the Conservatives the Liberals could not bring in so good a bill, nor any bill, because it would ruin them through dissensions. This fact seems indisputable. Lord Rosebery declares that to give the church power to collect "rates" is to subvert the principles of British freedom and that the pretended *unity of control* is the flimsiest kind of sham, while Episcopalian managers appoint only Episcopalian teachers. He more than hints that if he were a Nonconformist he would refuse to obey the law and withstand "the little tyrant of his field." Dr. Clifford, speaking for the Baptists and many others, declares flatly that the law must be resisted.

It is far from improbable that the Liberals and Nonconformists are embittered chiefly through disappointment that the act of 1870 was not allowed to do its complete work, which, in their estimate, would have involved the complete ruin of the church schools. The present panic concerning the need of education as a

weapon against commercial rivals favored the board schools, which, as they selected teachers solely on grounds of educational efficiency, naturally afforded better educational opportunities than the church schools, which selected teachers partly on other and to them more important grounds.

Even in this rough sketch of the largest points of a comprehensive and complicated measure, it must be added that the bill makes an honest, though not masterly effort to coördinate elementary, secondary and technical departments of the very disjointed English educational *system* or, rather, *arrangement*.

With more money the church schools must do better work. The secular part of their programme will be scrutinized as never before. The power of the purse has always been a great power and may prove greater in this case than the Liberals now believe.

Conjecture as to results is perhaps idle. The long war is far from its end. Will the American idea prevail? Can it prevail without disestablishment? Will this act help or hinder disestablishment? Will there be a large access of desire for religious and sectarian education, such as hardly any American dreams of? Will the Episcopalians gradually relinquish this desire themselves? To what extent will the new system handicap the English in their commercial struggle? Will the religious education of the denominational schools counterbalance the possibly superior keenness and acumen of the American system? Between these questions and their disturbing answers lie the experiences of a generation. We must hope for our own peace of mind, that time is on the side of broad national views of the moral and religious problems of nations in which citizenship must accommodate itself as the honorable ideal of very various races, and in which no name of a sect meets like apperception in comparatively many.

THE ORIGIN AND FUNCTION OF HABITS.

ARTHUR ALLIN.

I. THE ORGANIZATION OF HABITS.

Habits are the definite, regular rhythmic activities of an organism which have been acquired during the lifetime of that individual. In contrast with instincts they are reactions acquired *de novo*. Owing to the great increase of unorganized material in the nervous system (increase of plastic endowment) as compared with the lower animals, new combinations, associations and reactions are rendered possible. While instincts are adaptations and useful to the organism, they are fitted for a relatively simple, unchanging environment. With the increase of the social heritage the environment has become exceedingly complex and at the same time changeable. Hence the inflexibility and perdurability of instinctive life tends to become a disadvantage and plasticity or the possibility of the organization of new reactions, *i. e.*, habits, increasingly usurps a larger and larger field. The instincts of biology tend to give way to the habits of sociology, adaptability to the environment being the ever-present criterion. Thus the habits acquired through present-day education possess a relatively greater survival value for the individual and for the species than the instincts which are the survivals of the curriculum of the infinite past.

Habits may grow out of spontaneous, impulsive, reflex movements, may develop from variations occurring in connection with instincts and instinct-impulses or they may be acquired *de novo* in various ways, as for example, through simultaneous stimulation of two sensory areas, etc. The organism reacts in various ways to internal and external stimuli, many strange and new reactions arising in the process. Those which are useful for certain ends survive, while many others tend to disappear. This is especially evident in childhood. (1) After the completion of the first act the system, to quote Dr. Carpenter's words, "grows to the way in which it was first exercised." This automatic acquiescence of the system to its primary impressions and reactions makes possible the acquisitions of the social heritage. Reactions, whether good or bad, when they have attained the status of habits, are retained. Past habits which have been overcome are still retained in a latent condition. They exist side by side with reigning, dominant reactions, regaining ascendency at times in disease, weakness or crises when the governing hand of the so-called higher ideals loses its strength. The past, though latent, is always a possibility. Treacherous, lurking foes may be left

(1) Baldwin, Mental Development in the Child and in the Race, Chap. VII. Social and Ethical Interpretations, Part II, Chap. III.
Perhaps it is advisable to follow the terminology suggested by Osborn, according to which the term "modification" should be confined to acquired, and "variation" to congenital changes.

in the rear of the advancing column, or on the other hand every ally gained may but make more sure the success of the expedition.

1. *With maximum of automatism there is minimum of consciousness.* As a habit becomes more automatic, consciousness gradually ceases to accompany the individual parts of the action. Consciousness apparently accompanies those nervous processes in which there is a relatively large amount of resistance and hindrance to the transmission of nervous impulses. With growing ease comes unconsciousness. Progressive habituation or automatization means often the short-circuiting of nerve paths. In the construction or organization of a new habit the nervous impulses coming in from the sensory apparatus traverse the spinal cord or basal ganglia of the brain, attain certain cortical areas and then return by motor channels *via* the ganglia and possibly the spinal cord. As the habit becomes automatic the nervous impulses travel simply to or from the spinal cord or to and from the basal ganglia. At first the "central telephone office" is called up to secure connections, but after connections are established there is no need to trouble the central office.

Insufficiently organized habits tend continually to re-enter consciousness, producing vagueness, indecision and uncertainty. "What you can't do blindfold you can't do at all." "The high school boy who must halt in his mathematical work to remember the multiplication table, is enjoying the fruits of a pseudo-freedom in the grades. *There is no freedom except through automatism.* Automatism is not genius, but it is the hands and feet of genius." (1)

"The great thing then," says James, "in all education is to make our nervous system our ally instead of our enemy." Some writer has said that good habits are better than good principles. With the growing automatization, mental and cerebral energy is set free for further acquisition and co-ordination. Each ideal or practice becomes automatic and registered in the system with the result "That men may rise on stepping-stones of their dead selves to higher things."

If anyone should ask an expert typewriter operator where certain keys were on the keyboard of the instrument on which he daily writes, he could with difficulty rely on the accuracy of his visual memory; but on the other hand his fingers will not make a mistake, even when they are writing at a very rapid rate. He might not pass with credit an examination in visual memory, but in conduct he is adept. The conduct or service rendered is the desideratum. This should be taken into serious consideration, not only in school examinations, but also in all school work, which is but a preliminary exercise for the life of adult service.

2. *Hierarchy of habits for certain activities.* "A man is organized in spots— or rather in some spots far more than in others. This is true structurally and functionally. It is strikingly true of the various sense organs and their functions. No less is it true of the various parts of the central nervous system and their functions. A man has some habits which are sporadic and isolated, some which are bunched together in loose groups (such as the outlay of skills which make one a carpenter), and then, some habits which are knit together into a hierarchy.

"A hierarchy of habits may be described in this way: 1. There is a certain

(1) Bryan and Harter, Studies on the Telegraphic Language, The Acquisition of a Hierarchy of Habits, Psych. Rev., July, 1899, pp. 369 and 375.

number of habits which are elementary constituents of all the other habits within the hierarchy. 2. There are habits of a higher order which, embracing the lower as elements, are themselves in turn, elements of higher habits, and so on. (3) A habit of any order, when thoroughly acquired, has physiological, and, if conscious, psychological unity. The habits of lower order which are its elements, tend to lose themselves in it, and it tends to lose itself in habits of higher order when it appears as an element therein. (1)

This hierarchy of functions has been termed by Groos "the monarchistic constitution of the mind." Many other scientific facts and theories could be cited in substantiation of this view of the matter, such as, for example, Hughlings Jackson's three-level theory (2) confirmed by so many clinical experiences, the laws of reflex action as enunciated by Pflueger, the progressive medullation of nerve fibres (Flechsig) (3), the development of the individual from fundamental to accessory activities (Ross), etc. (4)

The hierarchy of instincts and reflexes which represents to us the bequest of the unconquerable past is still further extended and enlarged in the acquisition of the social heritage. This also is transmitted to us in hierarchical fashion, and owing to the plasticity of the nervous system in youth, is acquired educationally by the young. Thus acquired habits tend to represent the ideals, laws and standards of a very highly developed society. The imperial tone of our ideals re-echoes the sovereign behests of accumulated wisdom. The "Stern Daughter of the Voice of God" gives utterance to few justifying reasons—they have been lost in a long-forgotten past.

Thus conscience grows. As there is no one imagination but an imagination for each sensory cortical area and for each system of ideas, so there may be said to be not one conscience but many, a conscience for every dominant system of ideas and reactions, a conscience for this subject of study, for that occupation, for this person and for that. Furthermore, these consciences form groups and systems which again are co-ordinated with or subordinated under other groups. Each dominant habit thus forms an imperative, with possible exceptions and conditions, but all are subject to the Categorical Imperative of Social Service.

Character is therefore a vast system of smaller systems of habits, the hierarchical constitution (5) of our natures probably extending even to molecular structure. It is as if the railroad systems of a country were all consolidated into one system or organization with one board of managers at its head directing an almost endless chain of subordinates. The systems of thoughts and habits form groups of systems, as for instance, in those cases where home and club life are used to serve business aims or where business enterprises and social life are subservient to the dominant habits of home life. A man's specialty or skill may be

(1) Bryan and Harter, Studies on the Telegraphic Language, loc. cit., pp. 360-361.
(2) Hughlings Jackson, Remarks on Evolution and Dissolution of the Nervous System, Journal of Mental Science, April, 1887, pp. 25-48.
(3) Flechsig, Gehirn und Seele, Leipsig, 1896.
(4) Ross. Diseases of the Nervous System, 1885, p. 83, ff. Burk, From Fundamental to Accessory in the Development of the Nervous System, Pedagogical Seminary, Vol. VI (1898), pp. 5-64.
(5) Ribot, in his Diseases of Will (1894), p. 113, also discusses hierarchic coordination.

a system quite different from that of his religion or artistic life, his common sense being usually a special system of uncommon sense or skill in some line of thought or action. His success is tantamount to the organization of his groups of systems of habits in such a way that they are a factor in the public service. "Profligacy consists not in spending, but in spending off the line of one's career." *In der Beschraenktheit zeigt sich der Meister.* Without the monarchistic constitution in the organization of habits one's actions are unstable as water, or remind us of the eternal rolling of a Sisyphus stone.

"It is striking how easily dexterities are acquired, if sufficient limitation is exercised. One-sidedness produces virtuosity. He who admires a spider for spinning his web, should bear in mind how limited his other faculties are. Nor should he forget that the spider did not learn his art himself, but that it was acquired slowly by innumerable generations of spiders and that this art is almost all they learned. Man takes to his bow and arrow if his nets fail to catch him food, but the spider must starve." (1)

Character may be said to be the sum total of our habits. As such only an infinitesimal part is present in consciousness at any time, different habits and different systems functioning at different times. Thus the major part of character is latent or potential, the present thought and action being a function of that potential character. As in the kaleidoscope, only one system is in view at a time. At one time Dr. Jekyll and at another Mr. Hyde is in the ascendency. The electric light is turned on in this room of the mansion while the others are in the dark; as the servant passes through the different rooms each room is lit in turn but is left to darkness the moment she leaves one room for another. This explains the many-sidedness of our natures, the different aspects of our characters which we manifest to our friends at different times, many inconsistencies of conduct, changing ideals in life, alternating personalities, conversion of opinion, and many similar matters. (2)

This organization into systems extends also to the extra-organic. One who is master of himself uses his sense and motor organs as tools and instruments for the furtherance of some higher plan. In the same way tools and instruments, animals and human beings are systematized in the carrying out of great commercial plans. Nevertheless the master in any field of activity must transform his lieutenant from a mere dependent and tool into a sympathetic participant in the fortune and honor of his establishment, must open the path to individual promotion, must give to industry and genius their legitimate share and must make his force of men and mechanics a co-operative band of willing workers aiming at the accomplishment of the ideals and purposes of the whole system. Good school government is obviously based on the same idea. The hierarchical system of organization is but the universal principle of the division of labor.

3. *Habit and interest.* The theory somewhat generally accepted by psychologists that pleasure is the psychical accompaniment of the discharge of surplus-stored energy and that pain is the accompaniment of an abnormal discharge due

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(1) Ewald Hering, Memory as a General Function of Organized Matter, Open Court Co., 1895.

(2) Note the derivation of such words as morality, ethics, habit, character, etc., etc.

to excessive stimulation or drain on the reserve (1), is, if true, pedagogically very interesting on account of the conclusions which may naturally be drawn from it. It may be taken for granted that surplus-stored energy will tend to accumulate in those nerve cells and muscles which function habitually. This increased function will, up to a certain limit, be accompanied by increase in strength, assimilative capacity and directive power; that is to say, the habit will be accompanied by greater pleasure, and on the psychological side the interest becomes more and more dominant and imperious. *The interest is, however, the sign and symbol of the underlying controlling habit.*

Progressive habituation often produces pleasure and interest. Kipling's Galley Slave is an instance of Rousseau's saying that slaves lose all in their chains, even a desire to leave them, and that tranquillity of life can also be found in a prison.

"But to-day I leave the galley and another takes my place;
There's my name upon the deck-beam—let it stand a little space.
I am free—to watch my messmates beating out to open main
Free of all that life can offer—save to handle sweep again.

By the brand upon my shoulder, by the gall of clinging steel,
By the welt the whips have left me, by the scars that never heal,
By eyes grown old with staring through the sun-wash on the brine,
I am paid in full for service—would that service still were mine!"

The prisoner of Chillon says,

"I learned to love despair.
* * * * * * *
My very chains and I grew friends,
So much a long communion tends
To make us what we are:—even I
Regained my freedom with a sigh."

Interests are therefore indicative or symbolic of habits and of growing capacities. *We do not things because they are interesting, but because they are habitual.* Imperious interests are imperious habits.

Habits may also be imperious without being interesting, for in addition to the instincts, reflex acts and secondarily automatic activities which may be unaccompanied by consciousness, the somewhat general consensus of physiological psychologists may be cited in support of the view that there are perceptions and ideas and accordingly habits, which are unaccompanied by either pleasure or pain. A pedagogy or an ethics built on the basis of interest is, therefore, not only incomplete in so far as it omits those acts which are indifferent to pleasure and pain—a large part of life—but also is deficient in causal explanation. Its analysis is not ultimate. It deals with signs and symbols—pleasure and pain—and not with the underlying controlling factors, *viz.*, habits. A calculus of pleasure must give way

(1) It is a common saying that a man is as old as his arteries. Many an individual in adult life lives on a lower level because of over-strain, never-ending examinations and demands too urgent for the organism still in its formative stages. The surplus energy and the consequent interest or zest in life are lacking. On the other hand a too superficial training in youth will produce similar results.

to a calculus of habit, and individual appreciation must give way to social service.

We follow our likings and inclinations because that is the way we are built. Function acts in harmony with structure. "It is because of this invariable experience of its moral and vital results that the new education follows the 'liking' of the boy; because 'liking' is in very deed 'the great ruler'; because it is here, in the real needs of our nature—in our need for struggle, conflict; in our need for expression, for creation; in our need for being of use, for taking a hand in the game; in our love of home, of country; because it is here, and not in the visible pedagogue, that we find the real schoolmaster, the stern, the inexorable one, the one who lays upon us the tasks that are really hard, who makes the calls upon our powers which they must hear and obey, and leaves in his track a more living power and a more far reaching and a firmer will." (1)

Every interest implanted means a habit implanted, and that means that the pupil becomes automatically progressive along that line. His interests are his teachers. He pursues ends of his own accord. This is the essence of the democratic idea: every man self-acting, his own teacher, an autocracy of each individual. The undemocratic forms of government treat the individual as an infant or as a potential political criminal. According to Hegel the history of mankind is a progress in the consciousness of freedom. Freedom, like Protestantism, may possibly be defined as doing what you please, following your interests, likings or habits. Whether those habits are determined in their nature, members of an all-embracing causal chain, would still remain a matter of investigation; some writers, however, claiming that determinism and free will are like the lion and the lamb lying down together—with the lamb inside the lion.

Spinoza, in the same spirit, endeavors to explain psychologically this feeling of freedom by citing facts in support of his statement that we think we are free because we are ignorant of the causes of our actions. There is certainly a manifest difference between those acts which are performed because of external compulsion and those performed because of individual initiative, interest or habit. The scientific justification for freedom and democracy evidently lies in the fact that men, allowed to follow their "bent," capacity or interest, will accomplish more than if subjected to external compulsion. Some will fail, others will become "cranks" and idiosyncratics, but in the long run the progress of the mass will probably be greater.

Habit and interest also play an important role in the acquisition of knowledge. One of the prime conditions necessary for the attainment of knowledge is that new facts be associated with the facts already attained. Isolated facts possess little foothold in memory. If, therefore, the interests or habits of the pupil be aroused to such an extent that he thinks over the new facts (psychologically speaking, associated ideas are aroused), then the new facts are attached or linked to the older system and will henceforth belong to that system. In the associational life of the individual, isolation means oblivion. Organization or incorporation into systems means everything. Appealing to past habits is simply linking or grafting on new facts to older systems. A prime pedagogical

(1) Joseph Lee, Münsterberg on the New Education, Educational Review, Sept., 1900, p. 137.

necessity, then, is to keep interests, *i. e.*, older habits, aroused in every subject. To live without interest is to live without initiative; the throttle is closed and nothing but external compulsion will move the machine. One of the worst curses that can befall a nation or individual is what a German writer has called *verdammte Beduerfnisslosigkeit*. Instead, therefore, of barely assigning a new lesson, let the interests and needs of the pupil be first aroused by stirring up a problem, giving some interesting information, solving one of the new problems, asking pupils to hunt up all the information possible on the new topic, asking the pupils to tell the teacher the facts about the next lesson without her asking for them, etc., etc. Assimilation of new knowledge is not assimilation, it is a concatenation, combination, linkage—or in short, association. Let the old habit react on the new and the new becomes the old. "Any object not interesting in itself may become interesting through becoming associated with an object in which an interest already exists. The two associated objects grow, as it were, together: the interesting portion sheds its quality over the whole; and thus things not interesting in their own right borrow an interest which becomes as real and as strong as that of any natively interesting thing. The odd circumstance is that the borrowing does not impoverish the source, the objects taken together being more interesting, perhaps, than the originally interesting portion was by itself." "From all these facts there emerges a very simple abstract program for the teacher to follow in keeping the attention of the child: Begin with the line of his native interests and offer him objects that have some immediate connection with these." "Next, step by step, connect with these first objects and experiences the latter objects and ideas which you wish to instill. Associate the new with the old in some natural and telling way, so that the interest, being shed along from point to point, finally suffuses the entire system of objects of thought." (1)

4. *The end of habit.* The end of habit should be social utility, a character devoted to social service. "Character means power of social agency, organized capacity of social functioning. It means social insight or intelligence, social executive power, and social interest or responsiveness." (2) That man is therefore educated who knows and feels the needs of society, has the ability to promote them, and has the willingness and disposition to do so. "As to methods," says Dr. Dewey, "this principle"—that man exists for society, and that the school should be a social community which reflects and organizes the fundamental principles of all community life—"when applied, means that emphasis must be upon construction and giving out, rather than upon absorption and mere learning. We fail to recognize how essentially individualistic the latter methods are, and how unconsciously, yet how certainly and effectively, they react into the child's way of judging and of acting. Imagine forty children all engaged in reading the same books, and in preparing and reciting the same lessons day after day. Suppose that this constitutes by far the larger part of their work, and that they are continually judged from the standpoint of what they are able to take in in a study hour, and to reproduce in a recitation hour. There is next

(1) James' Talks to Teachers (New York), 1899, pp. 94-96.
(2) Dewey, Third Year Book of the National Herbart Society.

to no opportunity here for any social or moral division of labor. There is no opportunity for each child to work out something specifically his own, which he may contribute to the common stock, while he, in turn, participated in the productions of others. All are said to do exactly the same work and turn out the same results. The social spirit is not cultivated — in fact, in so far as this method gets in its work, it gradually atrophies from lack of use." (1)

To be of social service, habits of expression must be cultivated in order to utilize the habits of impression. As James puts it, "No reception without reaction; no impression without correlative expression—this is the great maxim which the teacher ought never to forget. An impression which simply flows in at pupils' eyes or ears, and in no way modifies his active life, is an impression gone to waste. It is physiologically incomplete. It leaves no fruits behind it in the way of capacity acquired. Even as mere impression, it fails to produce its proper effect upon the memory; for, to remain fully among the acquisitions of this latter faculty, it must be wrought into the whole cycle of our operations. Its *motor consequences* are what clinch it. Some effects due to it in the way of an activity must return to the mind in the form of the *sensation of having acted*, and connect itself with the impression. The most durable impressions are those on account of which we speak or act, or else are inwardly convulsed." (2)

"When we turn to modern pedagogics, we see how enormously the field of active conduct has been extended by the introduction of all these methods of concrete object teaching which are the glory of our contemporary schools. Verbal reactions, useful as they are, are insufficient. The pupil's words may be right, but the conceptions corresponding to them are often direfully wrong. In a modern school, therefore, they form only a small part of what the pupil is required to do. He must keep notebooks, make drawing, plans and maps, take measurements, enter the laboratory and perform experiments, consult authorities and write essays. He must do in his fashion what is often laughed at by outsiders when it appears in prospectuses under the title of "original work," but what is really the only possible training for the doing of original work thereafter. The most colossal improvements which recent years have seen in secondary education lie in the introduction of the manual training schools; not because they will give us a people more handy and practical for domestic life and better skilled in trades, but because they will give us citizens with an entirely different intellectual fibre. Laboratory work and shop work engender a habit of observation, a knowledge of the difference between accuracy and vagueness, and an insight into nature's complexity and into the inadequacy of all abstract verbal accounts of real phenomena, which, once wrought into the mind, remain there as life-long possessions. They confer precision; because if you are *doing* a thing, you must do it definitely right or definitely wrong. They give honesty; for, when you express yourself by making things, and not by using words, it becomes impossible to dissimulate your vagueness or ignorance by ambiguity. They beget a habit of self-reliance; they keep the interest and attention always

(1) Dewey, Third Year Book of the National Herbart Society.
(2) James, loc. cit.

cheerfully engaged, and reduce the teacher's *disciplinary* functions to a minimum." (1)

It is also true, on the other hand, that excessive kinesis prevents formation of steady, persistent, consecutive habits of thought, just as excessive aesthesis tends to form a "walled-up" mind without executive power and hence without utility. A true character, like true ideas, is composed of habits (ideas, feelings and actions), which are really successful habits, habits which prove themselves socially fruitful. (2)

II. SOME RECENT EXPERIMENTAL CONCLUSIONS ON PRACTICE AND HABIT. (3)

1. *Expenditure of Nervous Energy*—Nervous energy discharged in a part of the brain by peripheral or central stimulation tends to cause a diffusion of nervous impulses over other nervous areas. Thus the tickling of the feet may start nervous impulses to every part of the nervous system. A telegram may cause great visceral and emotional disturbances. A small amount of strychnine introduced into the system will aid this process of nervous diffusion, causing quicker reaction and often irritability. Nervous weakness, epilepsy, etc., are conditions favorable to diffusion. This diffusion of nervous impulses, normal and abnormal, is the physiological basis of association of ideas and actions, and is thus a fundamental factor in our psychical life.

2. *Specialization in Diffusion*—Instead of a chaotic diffusion, nervous impulses may gradually take definite channels, following lines of least resistance. Inherited reflexes and instincts and formerly acquired habits may outline the growth of such paths or habits. The establishment of such paths means a limitation of the diffusion and an increase of the amount and force in the definite specialized channels thus established. With progress in habituation this energy expended may in time be limited or increased to meet the requirements of the case.

"Practice makes perfect" means no waste by diffusion, and the least expenditure of energy needful. (4) Martin's description of the education of the spinal cord is in point here. "Much of what is called educating our touch or our muscles is really education of the spinal cord. A person who begins to play the piano finds at first much difficulty in moving his fingers independently; the nervous impulses from the brain to the cord radiate from the spinal centers of the muscle which it is desired to move, to others. But with practice the independent movements become easy. So, too, the localizing power of the skin can be greatly increased by exercise, as one sees in blind persons who can often distinguish two stimuli on parts of the skin which are so near together as to give

(1) James' Talks to Teachers (New York), 1899, p. 36.
(2) Cf. Georg Simmel, Ueber eine Beziehung der Selectionslehre zur Erkenntnisstheorie, Archiv. f. sys. Philos. Bd. 1, Heft 1, p. 34.
(3) Reprinted by courtesy of the editor of the Journal of Pedagogy (Vol. XIV, No. 3).
(4) Note the similarity of phenomena in physiological, economic and territorial division of labor.

to other people only one sensation. Such phenomena depend on the fact that the more often a nervous impulse has traveled along a given road in the gray matter, the easier does its path become, and the less does it tend to wander from it into others. We may compare the gray matter to a thicket; persons seeking to beat a road through from one point to another would keep the same general direction, determined by the larger obstacles in the way, but all would diverge more or less from the straight path on account of the undergrowth, tree trunks, etc., and would meet with considerable difficulty in their progress. After some hundreds had passed, however, a tolerably beaten track would be marked out, along which travel would be easy and all after-comers would take it. If instead of one entry and one exit we imagine thousands of each, and that of the paths between, certain have been often traveled, others less and some hardly at all, we get a pretty good mental picture of what happens in the passage of nervous impulses through the gray matter of the cord; the clearing of the more trodden paths answering to the effects of use and practice. The human cord and that of the frog must not, however, be looked upon as pathless thickets at the commencement; each individual inherits certain paths of least resistance, determined by the structure of the cord, which is the transmitted material result of the life experience of a long line of ancestry." (1)

3. Law of Short Exercise—A short exercise often repeated is preferable to long drawn-out practice for the rapid development of accurate adjustment of the muscles. Long uninterrupted practice at writing, drawing, piano playing, etc., wastes time and energy, cultivates inattentive habits and strengthens those wrong variations and adjustments which tend to gain a place in the chain of unconscious reactions. (2)

4. Law of Greatest Initial Gain—The greatest gain in rapidity and regularity of muscular action is made during the first periods of exercise; the rate of progress diminishes as practice continues at each experiment, as well as at successive experiments. (3) As the muscles come more completely under control, the influence of practice becomes less during each experiment. The "curve of practice," *i. e.*, the curve of change for a continuous experimental session, seems to be very similar to the "curve of habit," *i. e.*, the curve of change for successive sessions. In both alike the gain is most rapid in the first part of the exercise. In the latter part of the exercises progress is less perceptible; it is the stage of the expert. The experiments of Ebbinghaus and others in the learning of nonsense-syllables all bear out the same law. (4) Consciousness as an accompaniment of the habit tends to disappear the more automatic the habit becomes, the reason probably being that the nervous resistance gradually be-

(1) Martin, Human Body, pp. 580, 581.

(2) W. Smythe Johnson, Researches in Practice and Habit, 1889. Yale University Thesis, pp. 25, 14-25, 51.

(3) Ibid. pp. 14, 17. This has a causal connection with one of the laws of muscular work: "When a muscle begins to contract, it can lift the largest load; as the contraction proceeds, it can lift only a less and less load, and when it is at its maximum of shortening, only relatively very light loads." (Landois-Stirling, p. 606, Vol. II., 4th Ed.)

(4) Ebbinghaus, Grundzüge der Psychologie, Bd. I, Theil II. Pp. 624 ff.

comes less during the growth of the habit. "Man wird täglich dummer, aber brauchbarer," as a Badischer Beamter puts it.

5. *Law of Minimum Gain*—A minimum gain in rapidity during any practice period seems to be the best condition for impressing a habit upon the nervous system. The decrease of mal-adjustments, disadvantageous variations and hence probable error, is noticeable in a process of steady habituation as compared with a process in which spasmodic accelerations take place. (1) To attain the standard aimed at in the practice each error has to be rectified and a new habit begun. Thus three units of time (1) the time lost in the establishment of the error which might have been employed in acquiring the correct habit, (2) the time occupied by the obstructiveness of the bad habit, and (3) the founding of the new habit in the face of the old one, are taken where only one unit was necessary. Add to this the uncertainty of future behavior due to the persistence of the bad habit. It must be remembered that habits remain with us, though latent, even if they are superseded by better ones. If the subject puts forth the greatest effort in the beginning of an experiment, the error is correspondingly greater in the first part. But when the special effort is relaxed, muscles revert to their more accustomed speed of adjustment, and at the same time become more regular in their functioning. Ebbinghaus, in his experiments with nonsense-syllables, (2) discovered a psychological law which may have decided bearings on pedagogical practice. In the learning of a row of twelve nonsense-syllables, sixty-eight repetitions, each repetition immediately following its predecessor, were found to be less advantageous than thirty-eight repetitions of another row, which repetitions were distributed over three successive days. In other words, a distribution of the effort over several days with a relatively small amount of effort expended each day involves less effort in the sum total and a better result than the massing of effort at one period of time. G. E. Mueller, Jost, and Pilzecker have also confirmed these results by other experiments. (3) Jost also proved that the result was not due to fatigue in the case of the massing of the effort at one time. He also found that the results of the distribution of effort over a larger area of time was still more advantageous, *i. e.*, two repetitions on twelve successive days was better than eight repetitions on three successive days.

For pedagogical practice this is obviously important. The student reviews in the morning that which he has learned over night; the teacher holds numerous reviews and quizzes, and even the much abused examination receives some justification. The advertiser insists this week on what he insisted last week, and you are now quite firmly convinced that what he says is true, although you have never made a personal examination.

6. *Practice and Attention*—"The practice at each sitting should last only so long as the movements are purposely directed." (3) "Purposeful attention and persistent effort on the part of the subject are the two most essential ele-

(1) Yale Psychological Studies, loc. cit., p. 9.
(2) Ebbinghaus, Grundzüge, etc., pp. 629 ff.
(3) Jost. Die Associationsfestigkeit in ihrer Abhängigkeit von der Verteilung der Wiederholungen. Zeitschr. f. Psych. Bd. 14, S. 436. Mueller u. Pilzecker, Experimentelle Beitraege zur Lehre vom Gedächtnis, Zeitsch. f. Psych., Ergänzungsband. 1, 1900.

ments in practice for the establishment of any definite mode of muscular action." (1) This seems to be true especially of the beginning of practice, but towards the end, when the feelings and actions of an expert begin to manifest themselves, I venture to suggest that attention and consciousness may be at times harmful. In the first stages, however, attention means both an excellent nutritional condition of the muscles and nerve cells and excellent powers of co-ordination of movements to definite ends. Practice produces a more lasting and accurate habit when the muscles and nervous system are in an excellent condition of metabolism. Fatigue and weariness render success almost impossible. (2)

7. *Advantage of Muscular over Sensorial Reaction*—In so-called reaction time experiments, a technical term for those experiments in which the time is measured which elapses, to take one example, between, say, the perception of a sound and one's reaction to it by pressing a reaction-key—there is a decided difference in time between the sensorial reaction type and the muscular reaction type. In the "extreme muscular" type, as Lange, its first observer, called it, the attention of the person reacting is kept on the finger which is about to press the key as soon as the sound is perceived; in the "extreme sensorial" type the attention is kept on the sound-signal. Herr Lange's own muscular time averaged 0".123; his sensorial time, 0".230.

May not the fact of this difference in reaction be important pedagogically in so far as attention to the motor reaction rather than to the suggestion or copy produces greater rapidity, more correctness and less irregularity? Since suggestion and imitation play such important roles the matter is worthy of more extended experimental investigation and possible application.

8. *Summation of Stimuli*—By this is meant that a single weak stimulus, which is of itself incapable of discharging a reflex act, may, if repeated sufficiently often, produce this act. The single impulses are conducted to the central nervous system, in which the process of summation takes place. So far as purely reflex acts are concerned, Rosenthal found that three feeble stimuli per second are capable of producing the effect, although sixteen stimuli per second are most effective. (3) W. Stirling, according to Landois-Stirling, has shown it to be extremely probable that all reflex acts are due to the repetition of impulses in the nerve centers. (4) The psychological experiment is well known of stimulating the leg of a brainless frog a number of times if the first stimulation does not succeed.

The sound of a doorbell may not call up much of a motor response, but repeated often (Halloween night) may cause a very considerable response. A slight tickling when one is asleep or awake may, if continued, produce convulsive responses. "To strike a horse repeatedly on the same spot is to invite him to kick." Continued dropping of water from a faucet during the night, or the intermittent sounds of a mouse gnawing, produce extreme irritability.

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(1) Yale Psychological Studies, p. 25.
(2) Ib. p. 16.
(3) See Landois-Stirling, Vol. II, 606-617, on the conditions of muscular activity.
(4) Landois-Stirling, Vol. II, p. 785 (4th Ed.).

Stories of ingenious systems of torture of a similar nature for prisoners will readily occur to the reader. Repeated losses, as, *e. g.*, Job's, continued insults, mannerisms, especially of those one dislikes, continued criticism of one's personal appearance, continued disobedience of one's requests in classroom work, old songs, old stories, etc., are instances in point. Continued acts of kindness and love or of hate produce eventually a strong and steady disposition in the recipient. Similarly with repeated dreams in the minds of the nervous or superstitious.

Nagging is one continuous *jerking* at the reins of authority. Nerves are said to be "worn to a frazzle" by this unintermittent process. The sheer exhaustion of patience is a popular equivalent for the scientific phrase of summation of stimuli. The process is the same in the irritation produced by, say, an ill-fitting garment, as it is in the rebellious thoughts induced by the small talk and small thoughts of a more or less constant companion. Nagging often originates in an excessive narrowing or widening of interests. Too many duties are assumed, or there are not enough on which the full tide of vital activities can be expended. In the one case exhaustion supervenes, and in the other the horizon is filled with petty trifles and wrong perspectives.

This law is of wide general application, as is evidenced by a multitude of facts. In the schoolroom the teacher's loud voice, nagging, slovenly dress or gait, mannerisms of speech and gesture, tone of voice, low ideals of thought and behavior may finally cause a very decided revulsion. The steady persistence of higher types of thought and feeling will as surely culminate in action. Good examples should act as the drama acts, by suggestion rather than by homily. A confiding young son once told his father that he didn't like his Aunt Jane. When asked the reason he said, "Oh, she's always talking about G-a-w-d." In approaching a German theater one generally meets a number of vendors of the programmes or of the words of the play. One approaches the first of them with a confident shake of the head, but by the time the last one is reached, confidence has collapsed and the summation of stimuli has accomplished its mission. The psychology of advertising shows many evidences of this law. "Pears' soap is the best." Temptation in all its forms usually works by the summation of stimuli. The young man of slight moral resistance, on his way home in the evening, passes through one, it may be two, streets of saloons; in the third street his inhibitory power is exhausted and he passes helplessly through the doors.

9. Cross-Education—Training of one portion of the body trains at the same time the symmetrical part and also neighboring parts. (1) Volkmann relates (2) experiments showing that practice of the finger tip of the left hand increases the fineness of the touch of the finger-tip of the right hand, but does not increase that of the left forearm. Practice on the third phalanx increases

(1) E. W. Scripture, Theodate Smith and Emily M. Brown, in Yale Psychological Studies, Vol. 2, pp. 114-119, 1894.

(2) Volkmann, Ueber den Einfluss der Uebung auf das Erkennen rauemlicher Distanzen, Ber. d. k. Sæchs. Ges. d. Wiss., math.-phys. Kl. 1858, X38.

the fineness on the first phalanx. Fechner (1) relates an observation by Weber on the ability to write with the left hand obtained by learning with the right hand. Fechner states that practice in writing the figure nine backwards with the left hand frequently caused him involuntarily to write the nine backward when he used the right.

These observations, says Scripture, seemed of sufficient importance to justify a further inquiry regarding the general law of education followed by our muscular abilities, and also regarding the possibility of what he briefly calls "cross-education." His conclusions were that the increase of steadiness of movement due to practice is not limited to the control of the muscles immediately trained, but affects the control of the corresponding muscles on the opposite side of the body. This training seems to be of a psychical rather than of a physical order and to lie principally in steadiness of attention. (2)

Scripture's hypothesis (3) for explaining cross-education is, "physiologically speaking, that the development of the center governing a particular member causes at the same time the development of higher centers connected with groups of members, psychologically speaking, development of the will power as a whole." Diffusion of nervous energy into neighboring nerve cells following most accustomed paths, *i. e.*, lines of least resistance, seem to explain to a large extent these phenomena of cross-education. (4)

10. The Law of the "Plateau"—Bryan and Harter, in their experiments on habit (5), claim that the improvement in learning to receive telegraphic messages, while rapid for a time, ceases at a point just below the required proficiency, to be followed later by a stage of more rapid improvement. "For many weeks there is an improvement which the student can feel sure of, and which is proved by objective tests. Then follows a long period when the student can feel no improvement and objective tests show little or none. At the last end of the plateau the messages in the main line are, according to the unanimous testimony of all who have experience in the matter, a senseless clatter to the student, practically as unintelligible as the same messages were months before. Suddenly, within a few days, the change comes, and the senseless clatter becomes intelligent speech. W. S. Johnson affirms that the "plateaus" mentioned by Bryan in the habit curve would seem rather to indicate resting periods in the effort. If the subject can be induced to sustain the same effort day by day, there will not be any "plateaus" in the habit curve. (6)

(1) Fechner, Beobachtungen, welche zu beweisen scheinen, dass durch die Uebung der Glieder der einen Seite die der anderen zugleich mitgeuebt werden, Ber. d. k. Sæchs. Ges. d. Wiss., math.-phys. Kl., 1858, X. 70.

(2) Scripture, Smith and Brown, op. cit., p. 118.

(3) Scripture, Recent Investigations in the Yale Laboratory, Psych. Rev., 1899, VI. 165.

(4) Note the similarity in Pflueger's Laws of Reflex Action. Note also the experiments of Urbantschitsch and Patrick's observations on right-handedness in the University of Iowa Studies in Psychology, Vol. I, 1897. For further observations the reader is referred to Walter W. Davis, Researches in Cross-Education, Studies from the Yale Psychological Laboratory, Vol. VI, 1898, and Vol. VIII.

(5) Bryan and Harter, Studies in the Physiology and Psychology of the Telegraphic Language, Psych. R., Vol. IV, No. 1, p. 52.

(6) Loc. cit., p. 33.

11. The Law of Sudden Attainment—After some study practice and experimentation (period of trial and probation) the goal of the effort is suddenly attained, the *knack* is acquired, the expert emerges from the novice stage. In the experimental stage the nervous energy seems to be diffused at random for some time, partial habits are formed, but the paths are not complete enough for easy action. Other and older habits perhaps tend to drain off the energy diffused, thus weakening the growing habits. This is instanced by the worry and confusion of thought of a business man. Small details will appear as important as the main items, but let him sleep over the matter and in the morning his affairs will appear in their true proportions. In the acquirement of a new language many persons experience this feeling of sudden mastery. Religious conversions are often but the culmination of long but concealed effort. Joy comes with the cessation of the inhibitory processes and with the final establishment of the habit. No man can serve with joy two masters. In matters of courtship the young man often says, "It seems I have known her for years." His long cherished ideals have suddenly met their realization. Habits of thought are freed from their inhibition and joy is the result.

12. Gain in Rapidity and Accuracy through Rhythm—Energy is saved, time gained, accuracy increased and amount of product enlarged by rhythmic movements. If the output of energy is so regulated that it follows a certain proportion and so regulated that the beginning and end of a movement always lie between the same spatial and temporal boundaries, we have the essence of habit and practice. Habit and practice largely mean equal intervals occupied by movements and equally strong movements of the same muscle or group of muscles. Proportion is its main characteristic. When freed from interference by the higher centres and the will the proportion in expenditure of time and energy is likely to be better maintained by the lower centres. When influenced by the higher centres (intelligence), the movement is likely to be hindered or accelerated by other ideomotor associations. Fatigue, a subjective measure of work performed, is less likely to arise the more practiced and habitual the movement may be. Fatigue more easily ensues when the amount of energy expended is at one time too great and at another time too small and when the intervals are irregular, demanding extra adjustments, etc. (1)

In the progress of socialization of the race through technic we see the same influence of rhythm. It is well known that the machine is useful because it saves time and labor but does this because of its rhythmic action. It can only enter with profit where movements are repeated with due uniformity, with the greatest rapidity, and where often the action of one part of the machine is but one instance out of a thousand similar ones in the same machine (*e. g.*, spinning in a wool factory). (2) The machine must be freed from causes of irregularity, such as change of material, change of caprice in the mind of the operator, etc. The

(1) Karl Buecher, Arbeit und Rhythmus, pp. 26-26.

(2) Schmoller, Grundriss der allgemeinen Volkswirtschaftslehre, Erster Theil, S. 219: "Die Uniformierung, Mechanisierung, hoechste Beschleunigung, und vollendete Praecision, welche das Wesen des machinellen Arbeitsprozesses characterisiert, wird wohl die ganze Volkswirtschaft indirekt beeinflussen; tiefgreifend umbilden wird sie nur bestimmte, freilich sehr erhebliche Teile."

machine presupposes many parts performing their individual tasks (division of labor) and on the part of the object manufactured a division into many parts which can be made separately. Under these conditions the machine has revolutionized society. Inasmuch as the machine is an extension of the apparatus of the body, that which has been said of the machine may be inferred to be also largely true of the body.

13. Law of the Greatest Attainment through Freedom—A generation ago it was the accepted theory of educators generally that instruction, to be most effective, should cross the grain of the youthful mind; that if disinclination were shown to any particular study, the teacher should catch at this as his welcome clue; and that the scholar should thereafter be practiced and drilled, for his mind's good, against his indifference, his dislike, and even his repugnance, until he should learn to do well and freely that for which he had originally the strongest inaptitude. In a word, indisposition towards any kind of mental exercise was to be dealt with like a sinful inclination; war was to be made upon it until it should be conquered. Not only a better observation of life, but the study of physiological psychology, has led the educators of today to a widely different view of the office of instruction. It is now generally admitted that it is the first duty of the teacher to ascertain the true bent of the youthful mind, and that, so far as practicable, instruction should be made to conform thereto; that the successful teacher is not the one who compels the scholar to do at the last reasonably well that which he was at the first least disposed to do, but the one who brings the scholar to do, in the fullest degree and in the most perfect manner, that for which he has the greatest aptitude, leading him, with ever increasing freedom and pleasure of work, in the way which nature has pointed out; that in any other system of training there is enormous and irreparable loss of nervous force and moral enthusiasm, with the result certain to be lower and less desirable than the system which seeks to develop to their highest efficiency the native powers of the mind. (1)

14. The Law of Adequate Exercise—"I desire to challenge peremptorily," says General Walker, "the whole policy of giving out exercises of any appreciable degree of logical difficulty to children of an early age, thoroughly convinced that such a practice involves, to repeat the phrase already used, bad psychology, bad physiology and bad pedagogics." (2) General Walker further says, "The notion that exercises, either mental or physical, prescribed for young children, should be often up to the full limit of their powers and should at times exceed those powers, is distinctly false. The true gymnastic for the growing child is through exercises easy and pleasant, which lead insensibly up to ever higher planes of attainment, as the faculties are expanded and strengthened, according to their own law of growth through gentle and agreeable exercise. Wherever fatigue, confusion and the sense of strain begin, there the virtue of the exercise ceases, whether for the promoting of the powers as they exist or for creating new powers. Loss and waste —it may be much, it may be little—begin at this point, and go forward from this point, at a constantly accelerating ratio.

(1) General Walker, Discussions in Education, p. 225.
(2) Ibid, p. 226.

In college, thirty years ago, those of us who were given to athletics were accustomed to use heavy dumb-bells, the heavier the better. Twenty-four and thirty-two pounders; the famous "fifty-sixes" and even eighty-pound dumb-bells were much in favor with young fellows who desired to become strong. Today a prize fighter preparing to contest the championship of the world uses, habitually very light dumb-bells, just heavy enough to give a purpose to his blow, and to be distinctly felt at the end of the strokes. He makes with the light bell ten strokes to one he would make with the heavy bell, and gets twice as much good from the exercise. If this be the part of wisdom for the grown giant, overflowing with the exuberance of his strength, much more is such a course desirable in the case of the young, tender children, yet in the gristle, the frame and brain still plastic and yielding, with the possibilities of manhood and womanhood but dimly intimated.

Whether for the promotion of future growth, or for the training of the powers as they are, or for the acquisition of the inestimable art of rapid and accurate computation, school exercises in arithmetic should, in the opinion of the Boston Board, be easy and simple, with the resulting advantage of becoming more frequent than is possible, within any reasonable limits of time, in the case of the highly complicated and difficult sums and problems with which the traditional gymnastics deals."(1)

The experimental evidence derived from the labors of Ebbinghaus, G. E. Mueller and others with the learning of nonsense-syllables proves unmistakably the harm and danger arising from the imposition of excessively large burdens on the student. The "sums" and problems which even the "master" of the country school could hardly solve are mostly delightful memories of the "good old times" and are fortunately disappearing along with the head-splitting "lessons" and unexplained assignments of the next "ten pages." From the experiments of Ebbinghaus and others it is surprising to note the confusion, disorder and perplexity which arises when the number of syllables in each row is increased only a small amount over the largest number which the mind can master after having them once presented. In such a case the mind is not able to retain even as many syllables as were attained when the rows possessed fewer syllables. *A priori* one might imagine that at least as many syllables would be retained while the excessive syllables would be omitted, but in reality the inability to master the excessive number injures also the ability for the lesser and the number of syllables reproduced after one view of them decreases very rapidly. While, for example, a row of six nonsense-syllables can be reproduced correctly almost without exception, after having once been seen, a row of twelve such syllables can only be reproduced in its first and last number? The subjective certainty also decreases with increase in number of syllables, the whole row being gradually mastered in parts. Individual parts once mastered are being continually brought into confusion by other parts not yet mastered. (2) This confusion introduces inaccuracy of judgment as may be seen from Bolton's experiments on memory in school children. He found that there is an apparent tendency to over-estimate the number of ideas presented to

(1) General Walker, Discussions in Education, p. 251.
(2) Ebbinghaus, Grundzuege der Psychologie. Bd. I. Th. II, p. 624.

the mind, when the number of ideas is slightly greater than the memory span; but the general rule is to under-estimate the number. (1)

15. Attainment and Nutrition—In a poor state of health, weakness or fatigue, more mistakes are possible, and consequently more time and energy are wasted. Slovenly habits of thought and action are generated. "Perfect inhibition is the sign of perfect health." Associated ideas and movements fail to appear, and maladjustments of various kinds occur. Visitors to foreign countries when fatigued tend to lose command of the language of the country they are visiting. Aphasia is increased in fatigue. What is learned in a state of fatigue is soon lost. Chronic fatigue produces introspection and consequent loss of objective associations. Social service is thus impaired. Inability or dislike to bearing responsibility is another way of saying the same thing. In weakness inattention gradually merges into abulia.

Fatigue rapidly ensues when the work is distasteful. Maggiora has shown that more can be accomplished without fatigue when the work is properly adjusted. Again, damp, muggy days, certain seasons, the time of day, etc., influence the working capacity of the organism, its interests and its attainments.

Weariness comes to a muscle, not because so much capital has been spent, but because it has been spent at too quick a rate. Its expenditure is greater than its income. Whether a muscle wearies or not with action, and how soon it wearies, will depend not so much on how much work it is called upon to do as on whether or no the expenditure involved in the work outruns the income. You may take a weak muscle, that is to say, a muscle with a scanty store of available living stuff, and a strong muscle, that is to say, one with an ample store; and by timely calls upon the weak one, and an imperious sudden demand on the strong one, you will get much work from the former, leaving it still fresh, while the latter is wearied before it has done a little of the work of the first. (2)

16. Warming Up—Initial or preliminary practice may often induce fatigue. After a short rest, however, better work, greater rapidity, and a greater amount of work can be attained than in the beginning of practice. This does not seem to be of universal application, but it is a quite general phenomenon. It may be noticed for instance in animals. Dogs on the chase, animals pursued, and especially race horses, show the effect of warming up.

Athletes, for example, ball-players, realize the importance of practice just before the game. A pitcher will hardly enter the box until he has his arm in working order by a few minutes' practice. Orators are often dull at first, but warm up. Experiments performed by E. G. Lancaster in lifting a weight with the index finger show the effects of this warming process. In the initial practice the subject did not lift more than 800 grams before the warming up occurred. In one instance the subject's warmed-up curve with 600 grams was continued a long time and then additions were made until he was lifting 1,075 grams, which he raised to a good height until stopped by the operator. There was a feeling of muscular exaltation that made it a pleasure to lift the weight after the warming up occurred. In

(1) Th. F. Bolton, The Growth of Memory in School Children, Amer. J. of Psych., Vol. IV, No. 4, p. 380.

(2) Sir Michael Foster, "Weariness," Nineteenth Century, September, 1893, p. 340.

studying the same phenomenon of warming up was observable. Religious services and school work beginning with musical exercise exhibit the same profitable preliminary practice.

According to Dr. Lancaster's experiments it is evident that persons "warmed up" in, say, an intellectual exercise, will show a warmed-up curve in physical exercise, although they may have rested physically up to the time of the physical experiment. (1)

17. Influence of Age on Memory—In learning nonsense-syllables, *i. e.*, syllables consisting of a vowel between two consonants, an adult, according to Ebbinghaus (2) is able to memorize much larger rows of syllables than can children. To give a relative estimate, those at the age of 18-20 can reproduce approximately one and a half times as many syllables as those from 8 to 10 years of age. After completed bodily development the figures remain practically constant. Ebbinghaus relates that for 20 years the figures have remained the same for him. Within certain limits we can say that, beginning with the age of 13-15, the "curve of practice" and the "curve of habit" are repeated in what may be called the "curve of life," that is to say, the rate of progress is greater in the beginning, then gradually falling off to a level.

18. Inaccuracy of Subjective Judgments—The objective accuracy of a repeated or "reproduced" row of nonsense-syllables and the subjective conscious estimate of their correctness do not always, by any means, coincide. A row is repeated easily and smoothly as if one had nothing to do with it, and one is considerably surprised to be informed afterwards by the person conducting the experiment that it was wholly and completely correct. Quite frequently the opposite occurs; the pleasant consciousness that the row has been correctly repeated is later disturbed by the fact that one or more errors have been made. (3)

Similar phenomena were observed by Prof. Judd, in experiments with illusions. The gradual disappearance of the illusion owing to continued practice was not a matter of consciousness and hence it could be inferred that the effects of practice were not always to be judged by subjective opinion, but rather by objective results. (4)

In the general phenomena of weariness it is quite frequently noticeable that the subjective estimate does not tally correctly with the real state of the body. Neither does the subjective feeling of exaltation always indicate a favorable condition of metabolism in the body.

One of the most marked characteristics of modern progress is the substitution of extra-organic instruments and natural forces for the erring and uncertain sense and motor instruments of the human organism. The stress of the times is ever toward automatic precision and certainty.

(1) E. G. Lancaster, Warming Up, Colorado College Studies, Vol. VII, 1898. For other researches bearing on this point of weariness and recovery the reader may be referred to Lombard's researches on The Effect of Voluntary Muscular Contractions, Amer. J. of Psychology, Vol. III, pp. 24-25. Lombard's experiments seem to point to the central nervous system as the seat of the successive rhythmic changes of weariness and recovery.

(2) Ebbinghaus, op. cit., p. 621.

(3) Ebbinghaus, op. cit., p. 623.

(4) C. H. Judd, Practice and Its Effects on the Perception of Illusions, Psych. Rev., Jan., 1902, p. 32.

THE LAW OF ACCELERATION AND INCREASE OF SENSORY STIMULATION.

ARTHUR ALLIN.

The fact that Pestalozzi's simple but wonderful intuitions have been followed by such magnificent fruit is ample testimony to the genius of the man. The school systems which have been founded upon his doctrine of sensory instruction are living monuments to the memory of this poor but genial Swiss. From the germs of his ideas and life have sprung the kindergarten, the laboratory method, nature study, manual training, and many other integral factors of our modern curriculum. His continual cry was one that has been echoed by nearly every pedagogical reformer since his day: *Das Fundament des Unterrichts ist die Anschauung.* "The foundation of education lies in sensory observation." "The first development of thought in the child," he said, "is very much disturbed by a wordy system of teaching." His demand that "We must psychologize instruction" (1) is but the fit and proper helpmate for the more recent demand, "we must socialize the school." Only in the union of these two complementary truths or processes can education be justified.

That which Pestalozzi discovered empirically and intuitively is based upon scientific truths. When he insisted persistently on personal observation and the acquisition of individual experience as a *sine qua non* of early education he was but following out the plan laid down by nature. Recent contributions of eminent histologists have given a scientific justification for this important pedagogic doctrine. It may be summed up as the law of Acceleration and Increase of Sensory Stimulation. This law on the physiological and anatomical side is the justification for laboratory methods, manual training, nature study and all object teaching.

From the investigations of Ramon a Cajal (2) and others it is known that between the sense-organs and the different regions of the cortex there exist closely connected chains of conductors or neurons by means of which one single impression taken up by one single element of the chain at the periphery is carried on, avalanche-like, by an ever increasing number of nerve cells until a very large number of nerve cells are excited in the cortex.

This appears to be a general law applicable to all the senses. Take for example the sense of sight. In the *fovea centralis retinae,* where visual acuteness

(1) "Ich will den menschlichen Unterricht psychologisieren."

(2) Ramon a Cajal, Einige Hypothesen ueber den anatomischen Mechanismus der Ideenbildung, der Association und der Aufmerksamkeit. Archiv für Anatomie und Physiologie, 1895. Also: Sur la morphologie et les connexions des éléments de la rétine des oiseaux. Anatomischer Anzeiger, 1889. Also: Les nouvelles idées sur la structure du système nerveux 2nd Ed., Paris, 1895. Also: The Coronian Lecture in Proceedings of the Royal Society, Vol. XV, London. Schwalbe, Anatomie der Sinnersorgane; Edinger and others.

is the greatest, one rod or cone affected by a ray of light carries the excitation over to a bipolar cell; this in turn conducts it further to a ganglion cell lying beneath it (cell of the ganglionic layer); this by means of its nerve prolongations branches out richly in the fore part of the corpora quadrigemina carrying the excitation over a considerable number of cell groups; finally the axis cylinders of these cell groups end in the occipital region of the cortex of the brain, where, by means of their branches, they come into contact with the bush-like endings of an innumerable number of pyramidal cells. Thus from a single impression received by a single cone, hundreds or perhaps thousands of nerve cells of a cortical area are discharged of their nervous energy.

The same process is observable in reference to the auditory apparatus. One or two hair cells of the Organ of Corti transmit the excitation of an acoustical nerve fibre (cell of the ganglion spirale of the cochlea), which on its side continues the excitation to the ventral acusticus nucleus of the medulla oblongata; here each acoustical root fibre by means of a bifurcation (Koelliker, Held and others) and numerous collaterals distributes the movement over numerous nerve cells. Each of the conductors or axis cylinders of the cells of the ventral nucleus runs to the corpus trapezoides of the medulla oblongata, where by means of their numerous collaterals, new series of neurons, which lie in the trapezium nucleus, the superior olivary body, the nucleus praeolivaris and the nucleus of the posterior corpora quadrigemina, enter into the chain of conduction; finally the excitation reaches the cortex, where it probably spreads over a considerable group of pyramidal cells.

This avalanche-like method of conduction is likewise observable, according to Ramon a Cajal, in the sense apparatus for smell. In fact, it appears to be a general arrangement for afferent nerves in general. Golgi, Cajal, von Lenhossek, van Gehuchten, Koelliker, Retzius and other well known histologists may be cited as authorities for these statements.

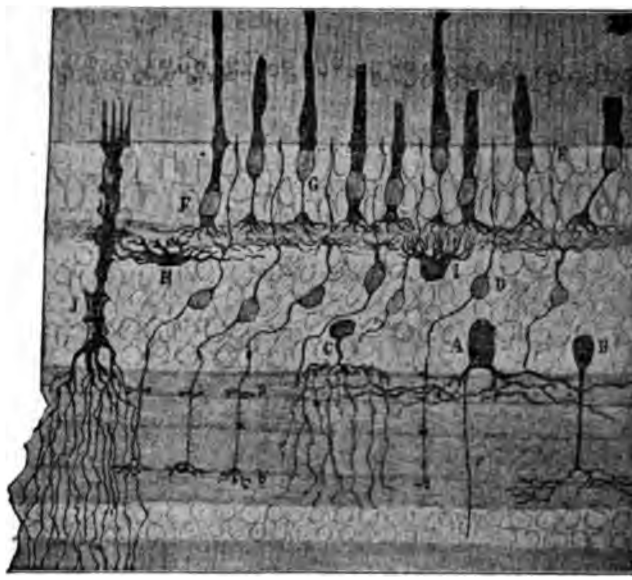
It is therefore evident that no matter how few the peripheral sensory cells may be which are stimulated, the number of pyramidal cells of the cortex set in motion by the excitation originating in the periphery is extraordinarily large. The physical basis therefore of a perception or sense-presentation is not a single cell, but rather a large number of cortical cells. Each cell in the cortex participating in a perception may be a unit functioning often in other perception-complexes. This is very important in the explanation of association, imagination, memory, etc.

Ramon a Cajal, from whom the major part of these anatomical facts is taken, suggests that the cortical sensory centers present, according to this view, a genuine, enlarged and widened projection of the sensory surface of the sense organs, and that, therefore, there exist, as some writers have supposed, a central retina and a central Organ of Corti. Each peripheral sensory cell, however, is represented in the cerebral cortex, not by one single pyramidal cell, as so many popular writers loosely assert, but by a group of such cells.

The exact nature of the nervous excitation is still problematical. It probably involves the decomposition of highly complex and unstable chemical compounds. It has been likened to a row of card houses or a row of bricks. A dis-

turbance, an explosion at one end of the row will set the whole row in commotion, the movement gathering impetus and momentum as it proceeds. If this be so the acceleration and increase of nervous excitation in the sensory apparatus is again noteworthy.

The following diagram taken from Cajal illustrates the first stages of this acceleration movement in the sensory mechanism. (1)



(Section of the retina of the chick impregnated by the Golgi method):

***A*, giant spongioblast; *B*, pear-shaped or long-stemmed spongioblast; *C*, small or neuroglia spongioblast; *D*, bipolar cell; *E*, club (massue) of Landolt; *F*, small stick (batonnet): *G*, cone; *H*, subreticular cellule; *I*, bipolar (?); *J*, fibre of Mueller.**

(This figure contains elements taken from different preparations.)

Furthermore, the primary peripheral stimulus may be almost indefinitely small but the resulting muscular reaction very large and altogether out of proportion to the strength of the primary excitation, as for example, in convulsions arising from tickling. It may be that the nerve cells lying in the path or chain of conduction are of the nature of reservoirs and that the liberated energy of each nerve cell releases a still greater store in the succeeding nerve cells. Moreover, a larger number of nerve cells are brought into play and the accumulated nervous energy of the final total will be out of all proportion to the number at first engaged. The spreading of epileptical convulsions is apparently of this nature.

Important as this law of acceleration and increase may be, another aspect of the question must, however, not be forgotten. At first sight one might suppose that if this law is true and valid, then conduct will be shaped and governed by

(1) From the article of Cajal in the Anatomischer Anzieger, cited above.

the nature and strength of the impinging stimuli. This, however, would not be taking into account the fact that the stimuli affect an already organized structure which is prepared to react to such and such stimuli and not to others. On the physiological side some nerve cells are *loaded*, and on the psychological side there are corresponding *interests*. Storm and besiege the organism as they may, some stimuli will produce, relatively speaking, no reaction, while on the other hand persistent, all-embracing or explosive reactions may be induced by apparently insignificant stimuli. All sorts of delectable oratory may not persuade the kitten to come nearer to you, but the trailing of a string across the floor appeals mightily to certain predatory characteristics peculiar to its kind. The Decalogue contains no commandment for parents to love their children, but all the thunders of Mount Sinai accompanied the command that children were to love and honor their parents. A mother sitting in a park surrounded by hundreds of noisy children will hear one little voice of pain above all the rest. It is evidently the waiting, attending attitude which brings the quick reaction. Forces are mobilized, ready for action. Where our interests are, there will be found the track we follow. Taking, therefore, two stimuli of apparently equal potency, the one that appeals to loaded sense-organs or to central nerve cells already filled with surplus-stored energy will succeed in eliciting a reaction much stronger than the one appealing to sense-organs or nerve cells exhausted by work, worry or disease.

Various phenomena of nervous action subsidiary and complementary in nature to this tendency to acceleration and increase of sensory stimulation might be cited in this connection. For instance, *the solidarity of the nervous system is conducive to the propagation of nervous impulses from one area or group of nerve cells to another*. This solidarity of function explains to some extent the reinforcement of currents by other currents from other areas. Pain is reinforced by severe excitation of the auditory or visual areas. Pleasure may be increased also by suitable excitation of other areas. Thus that which influences one area or group of nerve cells influences the rest of the system, this unity of function with relative differentiation of functions of different parts probably constituting the physical basis of personality.

Motor movements may reinforce other motor movements. Certain occupa- *sense areas.* All the phenomena of encouragement and discouragement may be cited here as witnesses. Instance a cake-walk, a wrestling match, a schoolboy fight, hand-clapping and foot-stamping at a contest.

Motor movements may reinforce other motor movements. Certain occupations induce more lively mental action, and on the other hand lively cerebral or mental action may induce more rapid corporeal activities. Clenching some object in the hand assists some in thinking, assists others in trials of skill, running, etc. (1) The German habit, sometimes observable, of striking the side of the nose with the forefinger, and the habit of scratching the head during the solution of some knotty problem, stimulate the trigeminus nerve endings, thus causing a larger determination of blood to the brain and increased mental action. (2)

(1) Some of these phenomena can of course be explained as automatisms, whereby troublesome movements are inhibited.
(2) Lauder Brunton, Action of Medicines, 1899, pp. 168 ff.

Additional sensory stimulation may call up by association or suggestion additional motor movements. I need only cite the very fine illustration of Baldwin: "Suppose we hang up a piece of meat over Carlo's head and tell him to jump for it. His first jump falls short of the meat. He jumps again and clears a greater distance. Why does he jump farther the second time? Not because he argues that a harder jump is necessary to secure the meat, but because by the first jump he got more smell, blood, color and appetite stimulus from the meat. Now suppose it to be a red rag instead of meat, and Carlo refuse to jump a second time. This is not because he coucludes the rag would choke him, but because he gets a kind of sensation which takes away what appetite stimulus he already had. The thing is a thing of sensational dynamogeny or suggestion, and the child's state of mind up to his twenty-fourth month, more or less, is just about the same."

In the dull despair of the teacher, rank incompetence is often charged to the discredit of the pupil when a wider range of power on the part of the teacher would have brought into play *additional* stimuli and thus have secured reaction and self-expression by the pupil.

The law of diffusion of nervous currents throws additional light upon the matter under discussion. Intense pains, for example, often involve a much larger area than that injured. It may result in convulsive movements of the whole body. Musical tones reinforce color and visual discrimination. (1) This law of diffusion is also exemplified in the association of ideas. From various well known experiments, stimulation of one sensory area in the cortex is known to reinforce the activity of neighboring areas. In the association of ideas the nervous process, whatever it may be, diffuses itself over various areas, but especially in the direction of one particular area, thereby calling up an associated idea or movement. The stimulation of the first sensory area necessarily involves by the law mentioned above the stimulation of a large number of nerve cells in that area. On the psychical side the accompanying perception will be full of details, vivid and persistent. The idea called up by association will comprise fewer details and may be less vivid and persistent owing to the probable circumstance that fewer nerve cells are engaged and less nervous energy involved. Thus perception, the first-hand information of direct sensory stimulation, is, comparatively speaking, full, vivid, complete and lasting. Second-hand information, *i. e.*, knowledge of one sense derived by association of ideas from the sense area of first stimulation, is on the other hand, less complete, somewhat vague, misty and less permanent.

The exceeding importance of this distinction between primary sensory knowledge and second-hand information can hardly be over-emphasized or over-illustrated. It is full of meaning and pregnant with consequences, not only in pedagogic matters, but in all affairs of life. An illustration from every-day life, simple and obvious though it may be, may serve to make the distinction clearer. Suppose, for example, that A has been present at the arrest of a man caught in the performance of a criminal act. Thanks to this process of increasing sensory stimulation, A is possessed of visual perceptions of great vividness, detail and persistency; he sees, as in a great canvas picture, the actions of the combatants, the faces of the surrounding crowd, the shrinking attitude of the prisoner, the police-

(1) Urbantschitsch, Amer. Jour. of Psychology, I: 530.

man handcuffing the accused and marching him off to jail. In A's description of the affair to B, who was not present, the psychical results produced in B's mind are of quite different nature from those acquired by A, who was present at the disturbance. B's auditory impressions as he listens to the descriptions while in one way somewhat complete because of immediate sensory stimulation may be classed as second-hand information with all the characteristics of such information; but imperfect as it may be, it stands a chance of still greater deterioration, because in the diffusion of nervous currents from the auditory area to various parts of the nervous system, and especially to the visual area, only a portion arrives at the visual area, and arouses associated ideas corresponding in some degree with the perceptual visual presentations of A, who was present at the disturbance. In B's visual picture of the occurrence the details are lacking, everything is dim, misty and uncertain. He fails perhaps to see the expression on the face of the criminal, the varying, changing attitudes of the crowd, etc. He lacks *particularity* in almost every case. It was *a* policeman, *a* criminal, and *a* dim and uncertain crowd. On the physiological side we may safely assert that in A's visual perceptions thousands of nerve cells in the occipital cortex were aroused to activity, whereas in B's visual image there were comparatively few visual nerve cells stimulated from the auditory area. The consequence was paucity of mental images, vagueness, instability and uncertainty.

Thus, to take another example, one present at the battle of Hastings would have some very realistic pictures of the dying men, the posts of the stockade shot with quivering arrows, Edith, the queen mother, searching for the body of her son Harold, and a thousand other details. No second-hand information could possibly produce the same result. In history teaching the nearest approach to perceptual reality can only be obtained by illustrations, paintings, and the use of the stereopticon.

It is evident at a glance that the present overwhelming movement towards illustrations in our school books, school rooms, monthly, weekly and daily publications, lectures, etc., is but a tardy recognition in a practical form of the vital importance of the law here under discussion.

Many pedagogical applications of the foregoing principles could be cited such as the following, selected at random: In the primary grades the making of boats, houses, a wagon, a loom, bow and arrow, etc., in the workshop attached to the school; the making of physiological and physiographical models; the introduction of photography in the various departments of school work; sloyd work, cooking, sewing, etc., the making of collections—not the keeping of them—of various articles and living things; an aquarium, an aviary, a botanical collection, a mineral collection, a collection of stamps for geographical work, etc., a collection of works of art, books, etc.; (Nature-study is almost a farce without the presence of the living things); the use of the stereopticon in the teaching of geography and history and all other subjects in which the natural objects are not available for presentation to the senses; use of the stereopticon in teaching art; geographical, geological, historical, commercial and political excursions wherever possible; visits to manufactories, mines, electric light plants, sessions of legislative bodies, stock exchanges, higher seats of learing, etc.; the use of the typewriter in the schools;

use of museums, art schools, pictures, magazines, etc.; the use of objects in the teaching of mathematics, especially in the earlier grades; introduction of the usages of the social world into the school; less traditional book lore and book methods and more socialization of the school room; introduction of weights and measures, banking facilities, etc.; introduction of social ends and aims and then the use of arithmetical, algebraical and geometrical processes as means to those ends (by the inevitable force of tradition, arithmetical processes, like all other processes, tend to become ends in themselves rather than means for the adequate supply of the demands of society); *viva voce* teaching of languages; employment of as many senses as possible in the teaching of languages, *i. e.*, by dictation, writing, speaking, etc; legislative sessions, newspaper reports, telegraphic dispatches, etc.; different forms of dancing in the inculcation of courtesy, grace and the finer emotions; introduction of dramatic presentations in the grades, as well as in the high schools; the introduction, to a certain extent, of the source method in the teaching of history. An arithmetical process, such as long division, should not be taught as such, but as a means for determining, say, the amount of the material needed for the new house of some child in the room. Children should not learn to read, but read for the sake of the subject-matter. So it should also be with the teaching of spelling, writing, composition, etc. The time needed for the teaching of these subjects in the schools will thus be materially shortened. The concrete social life of the pupil should be the starting point for the teacher. Should we ever leave it? Fame and fortune are awaiting the person who will transform the teaching of gymnastics from being more or less an end in itself, into the satisfaction of some social and organic concrete end. Will it come through the drama, pantomime, an extension of the Delsartean system, or through the organization of the already existing play activities based on the more accurate knowledge of the organic and social nature and functioning of youth? Certainly the present form of gymnastics teaching is crude and pedagogically insufficient.

As to manual training, the future school curriculum will undoubtedly describe it as an initiation into technic, as an introduction into the ways and means of historical progress in culture. Training in technic will take its place side by side with the other two great branches, the study of nature's forces and the study of man's social activities.

MISCELLANEA.

SOME STATISTICS BEARING ON EDUCATION IN THE UNITED STATES. (1)

I. Elementary Schools.

Expenditures on elementary education in Europe (1900-1901) approximately	$246,000,000
Expenditures on elementary education in United States (1900-1901)	$226,043,236
Value of all school property in United States (common schools)	$576,963,089
Enrollment in elementary schools of Europe, approximately	45,000,000
Enrollment in elementary schools of the United States	15,603,451
Total enrollment in public and private elementary schools in United States	16,984,751
Estimated number of children 5-18 years of age in 1901 in United States	21,897,678
Estimated population of United States in 1901	77,262,743
Number of teachers employed in United States (1900-1901)	430,004

Percentage of male teachers in United States:

1870-71	1879-80	1889-90	1899-1900	1900-1901
41.0	42.8	34.5	29.9	28.8

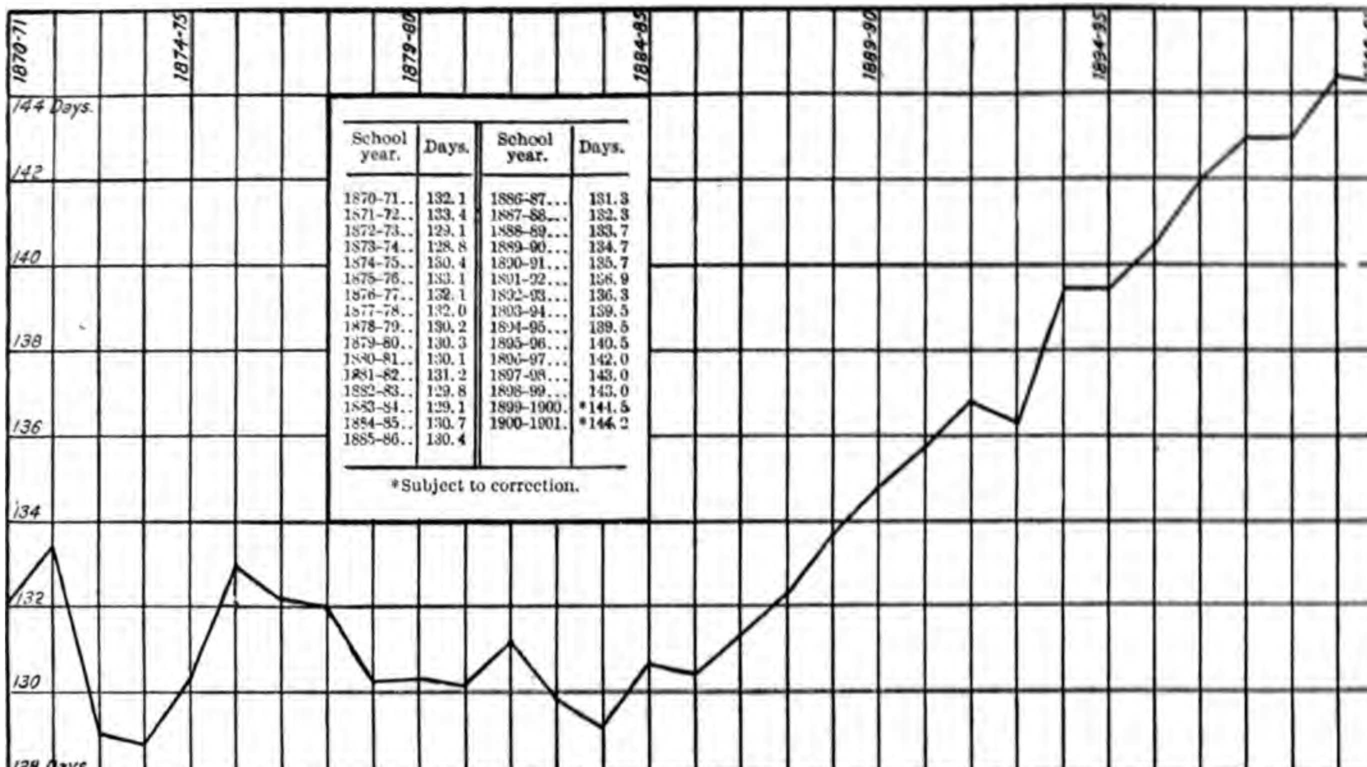
Average monthly salaries of teachers (1900-1901); males	$ 47.55
Average monthly salaries of teachers (1900-1901); females	39.17
Paid for teachers' and superintendents' salaries (1900-1901)	142,776,168.00
Average expenditure per pupil (for the whole school year)	21.14
Average daily expenditure per pupil	14.7 cents
School expenditure per capita of population (1900-1901)	$2.93
School expenditure per capita of population (1900-1901)	$1.75

(1) Compiled from Advance Sheets of the Report of the U. S. Commissioner of Education for 1900-1901. This report promises to be the best yet issued in a long line of most excellent reports.

Expenditure by the twenty largest cities for maintenance and operation of public schools and of police departments.

[Data from Bulletin of the Department of Labor, No. 42, September, 1902; calculations made in the Bureau of Education.]

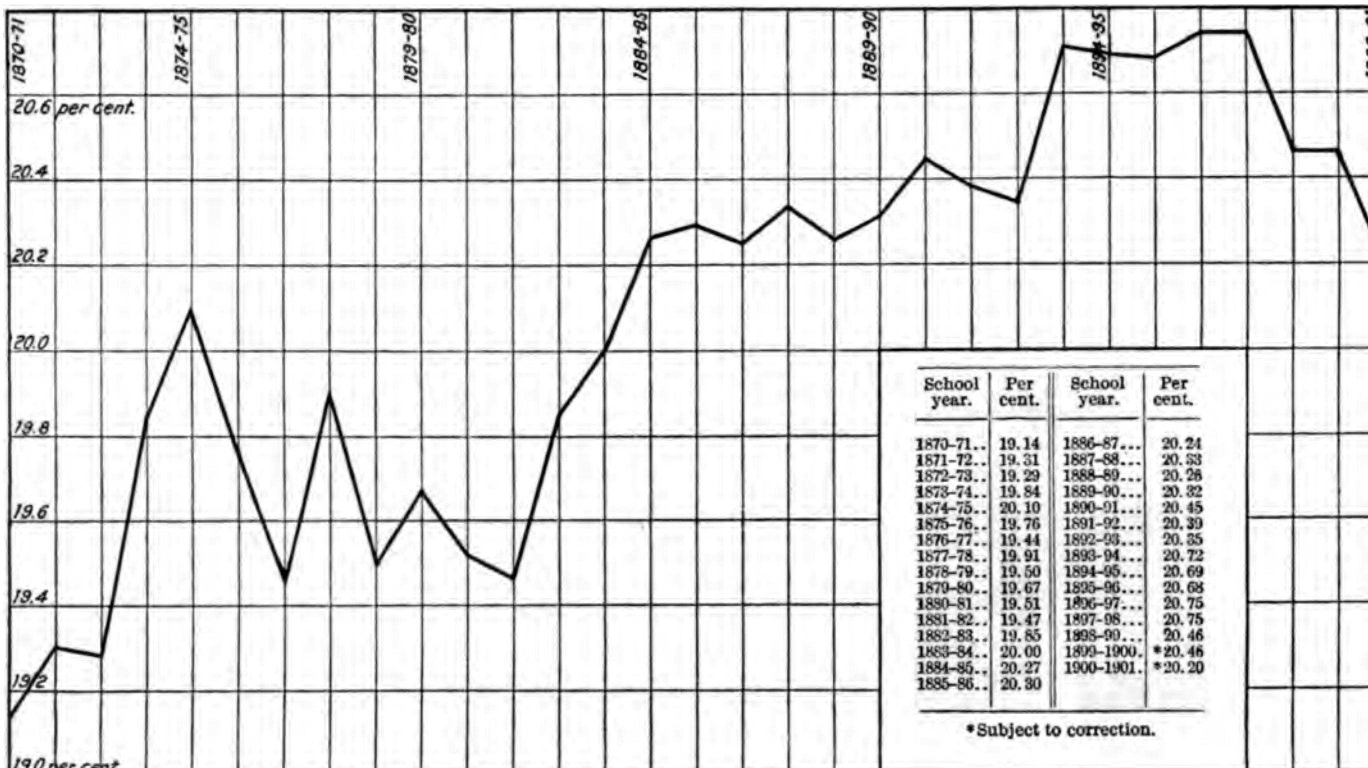
City.	Spent for schools, building omitted.	Spent for police department.	Ratio.
New York	$19,731,629	$10,199,206	$1.93 for schools to $1 for police.
Chicago	8,203,493	3,685,982	$2.23 for schools to $1 for police.
Philadelphia	3,319,604	3,036,264	$1.09 for schools to $1 for police.
St. Louis	1,526,140	1,602,182	$0.95 for schools to $1 for police.
Boston	3,043,640	1,754,151	$1.73 for schools to $1 for police.
Baltimore	1,417,392	967,823	$1.46 for schools to $1 for police.
Cleveland	1,257,345	417,932	$3.01 for schools to $1 for police.
Buffalo	1,161,834	793,294	$1.46 for schools to $1 for police.
San Francisco	1,166,763	789,251	$1.48 for schools to $1 for police.
Cincinnati	1,126,631	555,185	$2.03 for schools to $1 for police.
Pittsburg	843,648	490,287	$1.72 for schools to $1 for police.
New Orleans	478,025	231,374	$2.07 for schools to $1 for police.
Detroit	869,713	542,049	$1.60 for schools to $1 for police.
Milwaukee	764,968	342,508	$2.24 for schools to $1 for police.
Washington	1,182,916	687,922	$1.72 for schools to $1 for police.
Newark	830,081	428,495	$1.94 for schools to $1 for police.
Jersey City	500,332	421,616	$1.16 for schools to $1 for police.
Louisville	512,947	273,615	$1.87 for schools to $1 for police.
Minneapolis	736,981	216,698	$3.40 for schools to $1 for police.
Providence	739,695	371,875	$1.99 for schools to $1 for police.



School year.	Days.	School year.	Days.
1870-71..	132.1	1886-87...	131.3
1871-72..	133.4	1887-88...	132.3
1872-73..	129.1	1888-89...	133.7
1873-74..	128.8	1889-90...	134.7
1874-75..	130.4	1890-91...	135.7
1875-76..	133.1	1891-92...	136.9
1876-77..	132.1	1892-93...	136.3
1877-78..	132.0	1893-94...	139.5
1878-79..	130.2	1894-95...	139.5
1879-80..	130.3	1895-96...	140.5
1880-81..	130.1	1896-97...	142.0
1881-82..	131.2	1897-98...	143.0
1882-83..	129.8	1898-99...	143.0
1883-84..	129.1	1899-1900.	*144.5
1884-85..	130.7	1900-1901.	*144.2
1885-86..	130.4		

*Subject to correction.

DIAGRAM 1—*Average number of days the schools were kept each year since 1870-71.*



School year.	Per cent.	School year.	Per cent.
1870-71..	19.14	1886-87...	20.24
1871-72..	19.31	1887-88...	20.33
1872-73..	19.29	1888-89...	20.26
1873-74..	19.84	1889-90...	20.32
1874-75..	20.10	1890-91...	20.45
1875-76..	19.76	1891-92...	20.39
1876-77..	19.44	1892-93...	20.35
1877-78..	19.91	1893-94...	20.72
1878-79..	19.50	1894-95...	20.69
1879-80..	19.67	1895-96...	20.68
1880-81..	19.51	1896-97...	20.75
1881-82..	19.47	1897-98...	20.75
1882-83..	19.85	1898-99...	20.46
1883-84..	20.00	1899-1900.	*20.46
1884-85..	20.27	1900-1901.	*20.20
1885-86..	20.30		

*Subject to correction.

Diagram 2.—*Per cent. of the population enrolled in the common schools each year since 1870-71.*

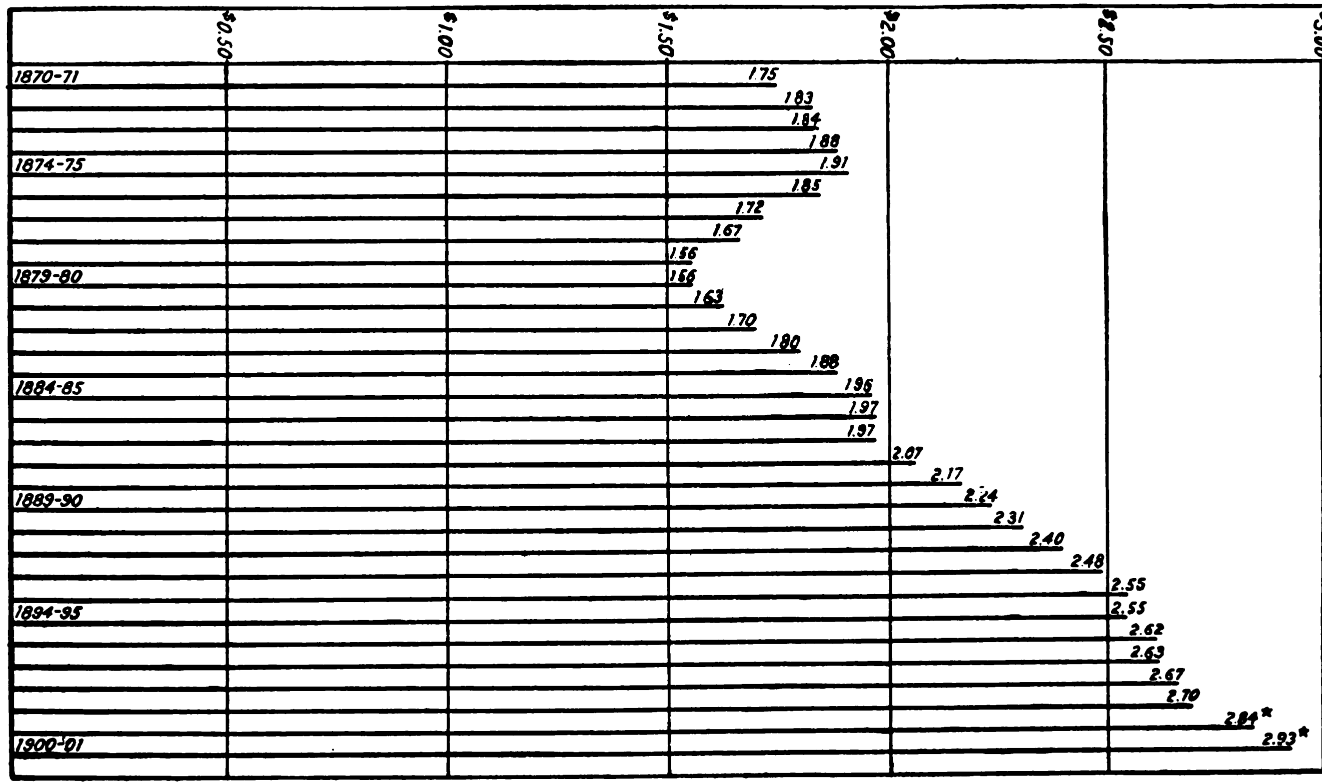


DIAGRAM 3.—*Amount expended for common schools per capita of population each year since 1870-71.*

DIAGRAM 4.—*Number of secondary students in public and private secondary schools.*

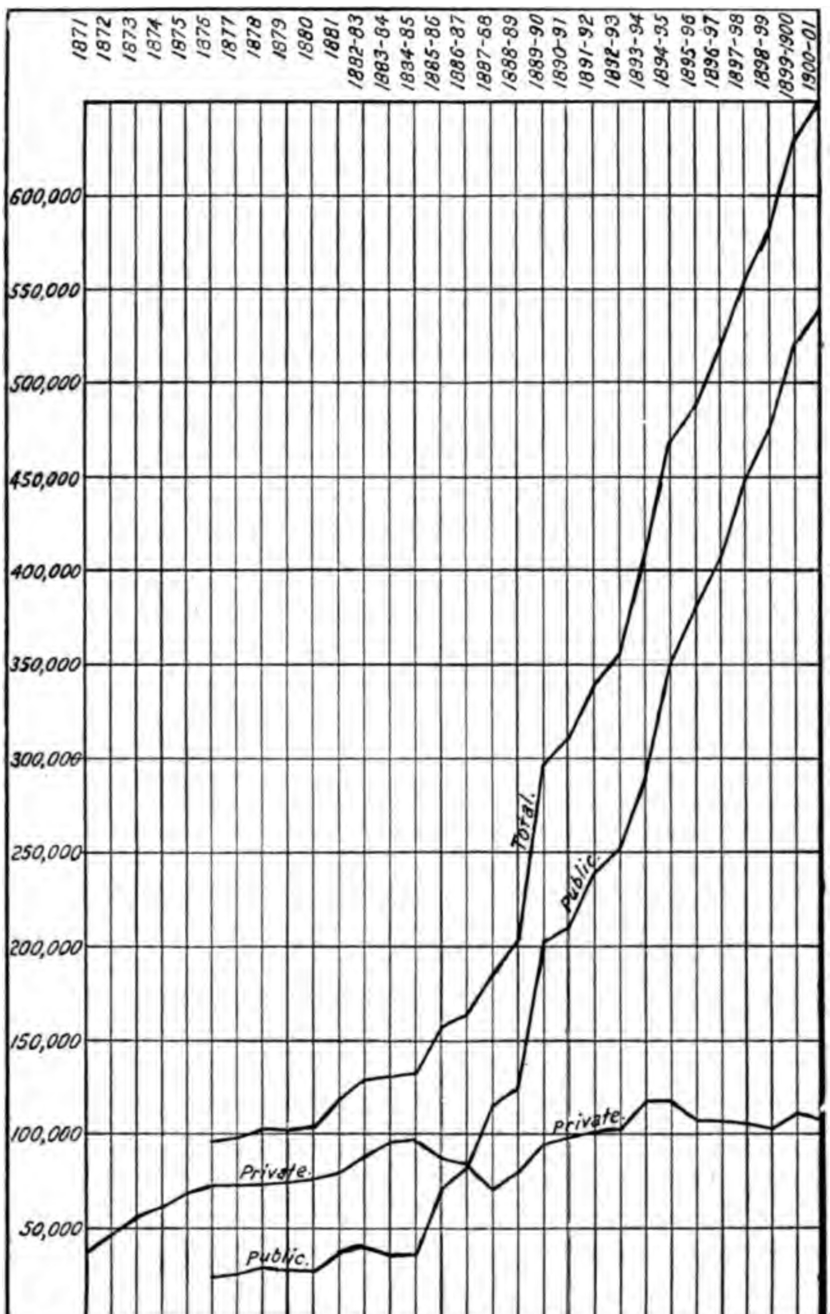
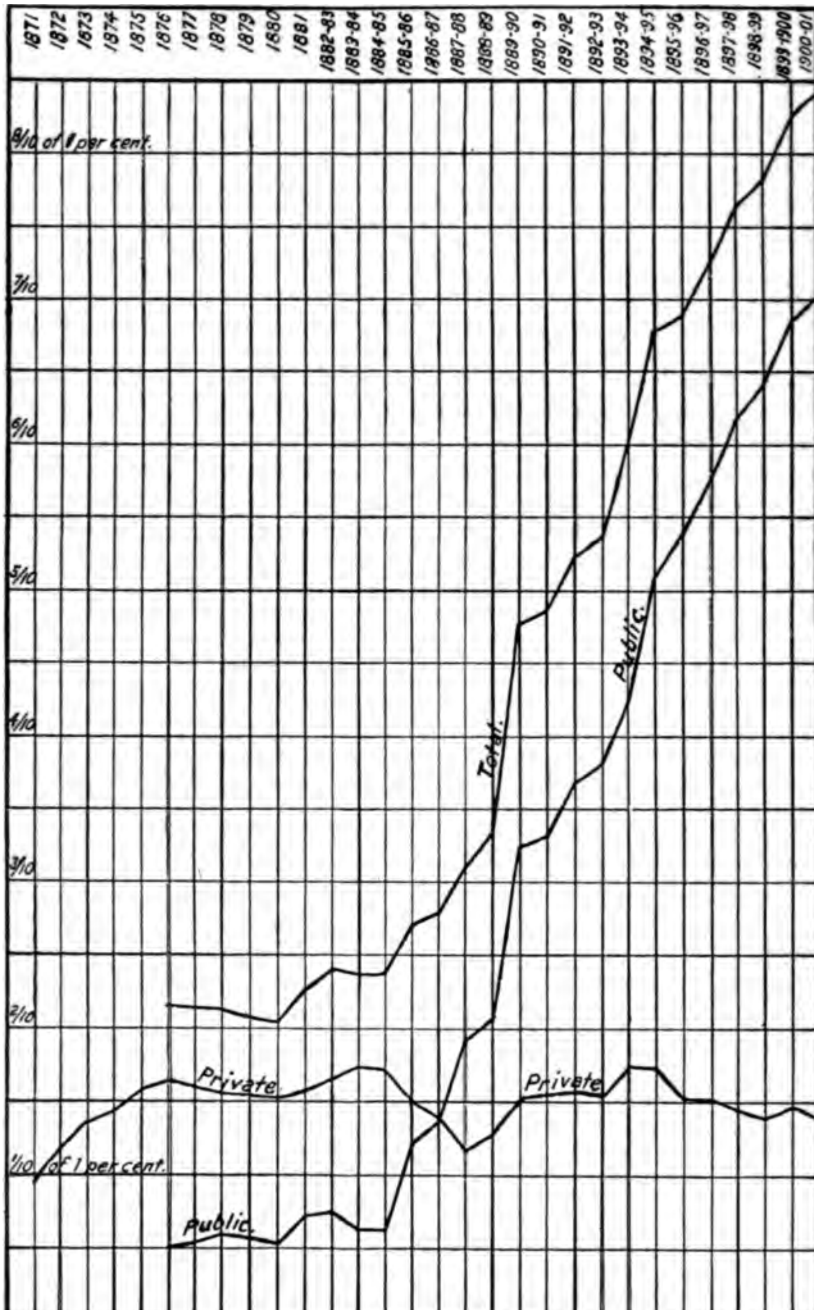


DIAGRAM 5.—*Percentage of the population enrolled as secondary students in public and private secondary schools.*



II. Secondary pupils in the United States.

Institutions.	Male.	Female.	Total.
Public high schools	224,584	317,146	541,730
Public normal schools	2,749	4,404	7,153
Public universities and colleges	7,287	2,570	9,857
Private high schools	53,813	54,408	108,221
Private normal schools	4,408	2,809	7,217
Private universities and colleges	30,016	14,785	44,801
Private colleges for women	....	5,614	5,614
Manual training schools	6,818	4,589	11,407
Total	329,675	406,325	726,000

The 736,000 secondary students comprised 4.25 per cent of the entire school enrollment of the country, which was 17,299,230. Almost 1 per cent of the whole population was receiving secondary instruction. In the last ten years the rate of increase of secondary students has been more rapid than the rate of increase in population. The number of secondary students in private institutions has very nearly kept pace with the growth of population from year to year, while the number of such students in public institutions has increased from about 3,500 to the million in 1891 to about 7,200 to the million in 1901. In 1891 the total number of public and private secondary students was about 5,800 to the million, while the number in 1901 was about 9,500 to the million.

Leaving out of consideration the secondary students in preparatory departments of colleges and in other institutions, the following table will illustrate the growth of public and private high schools proper since 1890:

Public and private High Schools since 1889-90.

Year reported.	Public.			Private.			Total.		
	Schools.	Teachers.	Students.	Schools.	Teachers.	Students.	Schools.	Teachers.	Students.
1889-90	2,526	9,120	202,963	1,632	7,209	94,931	4,158	16,329	297,894
1890-91	2,771	8,270	211,596	1,714	6,231	98,400	4,485	14,501	309,996
1891-92	3,035	9,564	239,556	1,550	7,093	100,739	4,585	16,657	340,295
1892-93	3,218	10,141	254,023	1,575	7,199	102,375	4,793	17,340	356,398
1893-94	3,964	12,120	289,274	1,982	8,009	118,645	5,946	20,129	407,919
1894-95	4,712	14,122	350,099	2,180	8,559	118,347	6,892	22,681	468,446
1895-96	4,974	15,700	380,493	2,106	8,752	106,654	7,080	24,452	487,147
1896-97	5,109	16,809	409,433	2,100	9,574	107,633	7,209	26,383	517,066
1897-98	5,315	17,941	449,600	1,990	9,357	105,225	7,305	27,298	554,825
1898-99	5,495	18,718	476,227	1,957	9,410	103,838	7,452	28,128	580,065
1899-1900	6,005	20,372	519,251	1,978	10,117	110,797	7,983	30,489	630,048
1900-1901	6,318	21,778	541,730	1,892	9,775	108,221	8,210	31,553	649,951

In the last dozen years there has been a steady increase in the proportion of High School students in certain leading secondary studies. In 1890 less than 34 per cent of the students were studying Latin, while in 1901 the per cent was about 50. The per cent studying algebra increased from nearly 43 in 1890 to nearly 56 in 1901. The following synopsis exhibits these percentages for each of the twelve years in certain studies:

Per cent. of the total number of secondary students in public and private high schools and academies in certain courses and studies, etc.

Students and studies.	1889-1890.	1890-1891.	1891-1892.	1892-1893.	1893-1894.	1894-1895.	1895-1896.	1896-1897.	1897-1898.	1898-1899.	1899-1900.	1900-1901.
Males	45.03	43.67	44.01	43.62	43.39	43.00	43.40	43.84	43.50	42.93	43.16	42.83
Females	54.97	56.33	55.99	56.38	56.61	57.00	56.60	56.16	56.50	57.07	56.84	57.17
Preparing for college, classical course	10.61	8.45	9.18	9.90	10.34	10.00	10.05	8.94	7.99	7.87	8.32	8.30
Preparing for college, scientific courses	8.05	6.38	7.59	8.22	7.3[illegible]	7.11	7.16	6.57	6.03	6.18	6.21	6.54
Total preparing for college	18.66	14.83	16.77	18.12	17.67	17.11	17.21	15.51	14.02	14.05	14.53	14.84
Graduates	10.05	10.51	10.87	11.46	11.88	11.60	11.73	11.95	11.75	11.78	11.74	11.95
Graduates prepared for college (*a*)	......	35.74	39.15	36.62	30.92	32.44	32.69	32.60	30.60	31.61	32.95	33.48
Studying—												
Latin	33.62	39.80	38.80	41.94	43.59	43.76	46.22	48.01	49.44	50.29	49.97	49.93
Greek	4.32	4.65	4.68	4.92	4.99	4.73	4.58	4.60	4.50	4.27	3.95	3.58
French	9.41	9.06	8.59	9.94	10.31	9.77	10.13	9.98	10.48	10.68	10.43	10.75
German	11.48	15.68	11.61	13.00	12.78	12.58	13.20	13.76	14.24	14.91	15.06	16.09
Algebra	42.77	49.89	47.65	49.92	52.71	52.40	53.46	54.22	55.29	56.21	55.08	55.66
Geometry	20.07	23.04	22.52	24.36	25.25	24.51	25.71	26.24	26.59	27.36	26.75	27.26
Trigonometry	......	......	2.96	3.61	3.80	3.25	3.15	3.08	2.83	2.58	2.42	2.54
Physics	21.36	23.06	22.04	22.25	24.02	22.15	21.85	20.89	20.48	19.97	18.88	18.24
Chemistry	9.62	10.37	10.08	9.98	10.31	9.31	9.15	9.18	8.55	8.64	8.00	7.86
Physical geography	......	......	......	......	......	22.44	24.93	24.64	24.33	23.75	22.88	22.42
Physiology	......	......	......	......	......	28.03	31.08	29.98	29.38	28.62	26.96	26.27
Rhetoric	......	......	......	......	......	31.31	32.27	33.78	35.30	36.70	37.70	39.69
English literature	......	......	......	......	......	......	......	......	38.90	40.60	41.19	43.90
History (other than U.S.)	27.83	29.77	31.35	33.46	35.78	34.65	35.73	36.08	37.68	38.32	37.80	38.41

(*a*) Per cent. of total number of graduates.

THE "NATURE-STUDY" EXHIBITION IN LONDON.

Complete success seems to have attended this inauguration of a new movement toward the introduction of a better system of instruction in elementary schools. Through the courtesy of the Royal Botanic Society of London an exhibition was held last Fall of appliances and methods employed in nature-study. In connection with the exhibition a series of conferences was held, at which a number of valuable addresses were given. A few extracts are here given:

Mr. Hanbury, President of the Board of Agriculture, presided at the first of the meetings on July 24 and spoke of the general educational value of nature-study and of the special dependence of agricultural industry upon habits of careful observation.

Lord Avebury took as the subject of the first address "The Study of Nature." He attributed a most curious ignorance of common things to the fact that great public schools omit the subject altogether, or devote to it only an hour or two in the week snatched from the insatiable demands of Latin and Greek. Oxford and Cambridge have most excellent science schools, but prizes and fellowships are still mainly given to classics and mathematics; degrees are given there, and now, alas! even at the University of London, without requiring any knowledge of the world in which we live.

Mr. Henry Hobhouse, M. P., read a paper on "How County Councils may encourage Nature-Study."

As it was not to be expected, he said, that every village schoolmistress would be able to teach nature-study, an arrangement would have to be made for peripatetic teachers to visit groups of small schools; school gardens and school museums would also have to be organized.

Prof. Geddes was unable to be present, and his paper was taken as read; its vital points are (1) that nature is a moving unity or pageant of the seasons, not an abstract syllabus of "object lessons" or even dissected "types;" (2) that the essential strategic point for the nature teacher is to give the pupil the joy of nature before the intellectual analysis of it; (3) among immediate practical possibilities, and taking excursions for granted, the essential desideratum to be secured for country and suburban schools without delay and for town schools so far as possible is the school garden, always provided this is designed to show to the full, the living seasonal beauty of its chosen plants and be not a cats' graveyard of labels, however orderly. The introduction of a flower border, however small, into the present desert playground is pleaded for on all grounds, moral as well as intellectual and æsthetic.

Prof. J. Arthur Thomson began his most interesting and suggestive paper by quoting the definition of nature-study given by his friend Prof. Geddes: it is "the habit of observing and thinking for one's self and at one's best, without books or helps, in the presence of the facts and in the open air." Prof. Thomson had next a word to say on the danger of doing nature-study teaching badly and distorting the child's outlook on the world. Given a man or woman with the mood of the naturalist, the country schoolmaster who knows and loves the birds, or the country schoolmistress who knows and loves the flowers, then the course of nature-study—now compulsory—is sure to be healthful. Given, however, a teacher who, through overwork, or preoccupation with other disciplines, or lack of early training, is only coercively, not organically, interested in nature-lore, then Prof. Thomson feared that the result would be very bad, indeed. The title of the paper was the "Seasonal Study of Natural History," and a sketch of a seasonal course was given, arranged so that the scholars faced appropriate problems at appropriate times. It was argued that the seasonal order and method of study, though not the easiest, was the most natural. It was the most primitive method, yet the exhibits seem to show that it was capable of being the most evolved. It followed up the pre-school education of the child, and was justified by physiological and psychological facts. Furthermore, the seasonal method worked exceedingly well in practice, being always relevant to what the pupils are seeing and feeling out of school, facilitating the desirable co-operation of the class in securing the specimens for the actual work, and being readily correlated with other school studies.

Mr. H. Coates illustrated the subject of local museums as aids in the teaching of nature with reference to Perth Museum, in connection with which children's essay competitions are most successfully held.

Lord Strathcona, as chairman at the second conference on July 28, gave an account of work in Canada carried out by the generosity of Sir William McDonald, who has given three-quarters of a million of money. Model farms were touched

upon, and Lord Strathcona gave a particularly interesting account of his own work in introducing vegetable culture into Labrador, which had previously been unknown.

Prof. Lloyd Morgan had also a definition to give when dealing with nature-study in elementary education. He said that it was "a means by which simple natural objects and processes acquire *meaning*." Like Prof. Thomson's paper, the whole question is so carefully considered that no brief notice could do it justice. The movement which the meeting was to foster and develop, according to the speaker, is part of that reform educational procedure which has been in progress for many years. One of the points to be regarded is the patchiness of a child's mind, to whom even the beginnings of science are impossible. The teacher, say a scientific botanist, must not, therefore, get tired of fostering the powers of observation and affording facilities for simple investigation, and instead endeavor to inculcate general laws and principles beyond the comprehension of the child. Technical terms where they are simple nouns and not descriptions are allowable, but after reading a long description of the dandelion taken from a nature-study book Prof. Morgan begged his hearers to stop before they got to "anthers syngenesious."

On Tuesday, July 29, the chair was taken by the Lord Balfour of Burleigh, K. T., Secretary for Scotland. He gave an account of the excellent progress of the "nature-study" movement started several years ago across the border. "Nature-study," he said, "must be rather looked upon by the children as recreation; their minds must not be filled with facts, but must be taught to make observations and to investigate. If this were done it would redound to the credit of education in all countries."—Nature, July 31, 1902.

REPORT OF A BRITISH COMMITTEE OF TEACHERS ON THE TEACHING OF MATHEMATICS.

Since Prof. Perry brought forward the subject of "The Teaching of Mathematics" at the meeting of the British Association last September, several associations of teachers have discussed the reforms suggested or appointed committees to report upon the matter. A committee of the Assistant Masters' Association has had the subject under consideration, and a preliminary report has been drawn up, from which it appears that masters in secondary schools are in favor of most of the reforms advocated by speakers at the British Association meeting. The report is as follows: I. *Arithmetic.* (1) The method of teaching in the early stages should be inductive and concrete. Actual measuring and weighing should be introduced as early as possible. (2) Decimals should be treated as an extension of the ordinary notation, their nature being illustrated by actual metric weights and measures. Multiplication and division of a decimal by a decimal would, we think, have to follow vulgar fractions. (3) The decimalization of English money and English weights and measures should be practiced frequently. (4) Approximate methods should be gradually introduced after the treatment of finite decimals. They should be taught with due regard to rigidity of proof. Appreciation of the degree of approximation should be continually insisted upon. (5) If "commercial arithmetic" is to be taught at all, the subject-matter should receive more ade-

quate and correct treatment, and the examples should be drawn from transactions as they actually occur. II. *Algebra*. (1) The foundation of algebra should be "literal arithmetic," *i. e.*, algebra should at first be arithmetic generalized. (2) The minus sign should receive its extended meaning from copious illustrations; and illustrations, not rigid proof, should also be resorted to for the purpose of the "rule of signs." (3) Algebra should often be applied to geometry. (4) Logarithms should form an important section of the subject. We believe that the graphic method could be very usefully employed in this connection. (5) We desire to deprecate the waste of time so commonly practiced in mere manipulation of symbols. III. *Geometry*. (1) We are strongly of opinion that the ordinary deductive geometry should be preceded and continually supplemented by concrete and inductive work. (2) Whilst "mensuration" might possibly be taught in connection with physics and arithmetic, we believe that the value of geometry would be enhanced by practical applications of the propositions as they occur. (3) We feel very strongly that Euclid's text is very unsuitable for teaching geometry. But we are impressed with the difficulty of abolishing its use in the face of external examinations. In the circumstances, we can only hope that examining bodies, even if they insist on Euclid's sequence, will allow greater latitude in methods of proof, and give greater prominence to easy "riders" and applications of geometry.—Nature, July 31, 1902.

SOME CONCLUSIONS AND SUGGESTIONS FROM EXPERIMENTS ON SPELLING IN THE CHICAGO SCHOOLS. (1)

1. In these tests of memory an attempt has been made to divest the matter to be memorized of as many associations as possible, and so to measure the native strength of the memory. The power thus measured is passive; it is blind; it attempts to take and give back without change, to return an echo of the sensations. It shows what the child can apprehend, not what he can comprehend. Good teaching attempts to make the mind active and alert, causing it to compare, associate and classify. It is the province of the school to discipline this native power of memory; to bring forth skill where originally there is only strength. The teacher should aim to develop from the native sense memory an organized rational memory. It is said that English spelling is illogical, but this is true in part only, and the teacher should use every available opportunity to see that the child uses his rational memory instead of depending too largely on the native force of his sense memory.

2. Those with superior memory power being in superior physical condition, as shown by the anthropometric tests, clearly indicates that the immediate sense memory is dependent upon good brain formation and nutrition. The skillful and rational use of this memory power is dependent upon habitual use, hence on education and experience. All these factors are significant in learning to spell.

(1) Report of Fred Warren Smedley, Director of the Department of Child-Study and Pedagogic Investigation, Chicago Public Schools, Report No. 3, 1900-1901.

3. Where the matter memorized has been divested of associations, repetition is necessary for the securing of deep and lasting impressions. Wherever logical association is possible, there can be a more efficacious method of study. In studying, the child should be habituated to depend upon comparing and classifying, rather than upon mere repetition. Children are so prone to depend upon blind repetition that they sometimes put forth as much effort in studying the words that they have long thoroughly known as they do upon unfamiliar words, and use as much energy in studying the parts of a word that present no difficulty as they do upon the unknown portions. A wise direction of the child's energies would greatly shorten the time necessary for the mastery of English orthography.

4. While usually the better spellers are possessed of better memory power than are the poor spellers, yet there are bad spellers with a high development of memory. Superior memory may make the acquisition of spelling easy, yet it by no means removes the necessity for some intelligent application on the part of the pupil. While most good spellers tend toward the visual type, still there are both good and bad spellers of each type.

5. The fact that children have the ear memory stronger during the early years suggests at once that the teaching of spelling to the young will be effective if the ear is appealed to; that there is probably a place for oral spelling; that there should be some pronunciation of syllables with the spelling; that the words presented to the child at first should be, as far as possible, phonetic in their spelling, leaving the "more cruel and unusual" forms of English orthography to be learned in later years when the eye memory has become stronger.

6. The investigation shows that there is no "memory period," no period in early school life when the memory is stronger than it is at any later portion of the child's life, a period especially adapted for learning to spell. While there are no memory stages, there are undoubtedly periods of interest that are especially favorable for the child's learning to spell; times when, through the influence of companions or teachers, the child is aroused from indifference or from a feeling that spelling is a small part of life to a recognition that is important.

7. It has been pointed out that during early school life the auditory memory is the stronger, and later that the visual memory is stronger. During the whole of school life the audio-visual memory is stronger than either the auditory or visual; that is, a simultaneous appeal to both sight and hearing produces a richer and more usable image than is brought about by an appeal to either sense alone. This fact is very far-reaching in its application to teaching. The audio-visual-articulatory memory, in which the impression is produced by an appeal to the hearing, sight and the muscle sense, is even stronger than the audio-visual. It would seem from this that the more senses we can appeal to, the deeper will be the impression. This fact should be made use of in spelling drills.

8. The aim in teaching spelling should be to render words of the most frequent use automatic, to have them so well known that in writing they will flow from the point of the pen, requiring but little thought as to their formation. Then there is a large class of words of less frequent occurrence which should be recalled on slight reflection. For the more unusual words the individual should have the dictionary habit so firmly fixed that he will conscientiously look up every word he

needs to write if in doubt about its correct spelling. The spelling of words is rendered automatic through practice in writing them. Though the first grasp of the word may well be made through other combinations of sense memories, yet the final retention of the spelling of most words should be through the audio-visual-hand-motor memory.

9. The per cent. of pupils having sight and hearing defects is greater among the poor spellers than among the good spellers; yet there are pupils with decided sensory defects among the very best spellers. While these sensory defects are handicaps in learning to spell, still they may be overcome, through careful application, by those pupils who have good memory power.

10. Much that has been said here concerning the teaching of spelling will apply with but slightly diminished force to instruction in the other branches of the curriculum.

SOME PEDAGOGIC CONCLUSIONS FROM THE REPORT OF 1899-1900. (1)

Many of the tests and measurements which this department has made are preliminary to other investigations, which, it is suggested, should be carried on in reference to different lines of mental development, methods of instruction, and school adjustments. It is believed that the utility of much of the work so far done will best appear as it forms a basis for these future investigations and compilations; yet there are certain truths important for educational theory and practice which have been so clearly foreshadowed as to warrant their being set forth here.

From the investigations of last year Dr. Christopher formulated the following deductions:

1. In general there is a distinct relationship in children between physical condition and intellectual capacity, the latter varying directly as the former.

2. The endurance (ergographic work) of boys is greater than that of girls at all ages, and the difference seems to increase after the age of nine.

3. There are certain anthropometric indications which warrant a careful and thorough investigation into the subject of co-education in the upper grammar grades.

4. Physical conditions should be made a factor in the grading of children for school work, and especially for the entrance into the first grade.

5. The great extremes in physical condition of pupils in the upper grammar grades, make it desirable to introduce great elasticity into the work of these grades.

6. The classes in Physical Culture should be graded on a physical instead of an intellectual basis.

The work this year, so far as it relates to them, confirmed these deductions, except as to the age, when great differentiation of the sexes in endurance begins. To these, certain other conclusions are added, not as settled beyond any possibility of modification, but yet as being fairly indicated by these tests.

1. The pubescent period is characterized by great and rapid changes in height, weight, strength of grip, vital capacity, and endurance. There seems

(1) Report No. 2 of Child-Study Department of the Chicago Public Schools.

to accompany this physical activity a corresponding intellectual and emotional activity. It is therefore a period when broad educational influences are most needed. From the pedagogic standpoint it is pre-eminently a time for character building.

2. The pubescent period is characterized by extensive range of all physical features of the individuals in it. Hence, although a period fit for great activity of the mass of children, it is also one of numerous individual exceptions to this general law. During this period a greater per cent. of individuals than usual pass beyond the range or normal limits set by the mass. It is a time, therefore, when the weak fail and the able forge to the front, and hence calls for a higher degree than usual of individualization of educational work and influence.

3. Unidexterity is a normal condition. Rapid and marked accentuation of unidexterity is a pubescent change. On the whole, there is a direct relationship between the degree of unidexterity and the intellectual progress of the pupil. At any given age of school life, bright or advanced pupils tend toward accentuated unidexterity, and dull or backward pupils tend toward ambidexterity. The pupils of the John Worthy (Bridewell) School are more nearly ambidextrous than even the backward pupils of the ordinary schools. Training in ambidexterity is training contrary to a law of child life.

4. Boys of school age at the Bridewell are inferior in all physical measurements to boys in the ordinary schools, and this inferiority seems to increase with age.

5. Defects of sight and hearing are more numerous among the dull and backward pupils. These defects should be taken into consideration in the seating of pupils. Only by removing the defects can the best advancement of the pupils be secured.

6. The number of eye and ear defects increases during the first years of school life. The causes of this increase should be investigated and as far as possible removed.

7. There are certain parts of the school day when pupils, on the average, have a higher storage of energy than at other periods. These periods should be utilized for the highest forms of educational work.

8. The stature of boys is greater than that of girls up to the age of eleven, when the girls surpass the boys and remain greater in stature up to the age of fourteen. After fourteen, girls increase in stature very slowly, and very slightly, while boys continue to increase rapidly until eighteen.

9. The weight of the girl surpasses that of the boy about a year later than her stature surpasses his and she maintains her superiority in weight to a later period of time than she maintains her superiority in height.

10. In height, sitting, girls surpass boys at the same age as in stature, viz., eleven years, but they maintain their superiority in this measurement for one year longer than they do in stature, which indicates that the more rapid growth of the boy at this age is in the lower extremities rather than in the trunk.

11. Commencing at the age of thirteen, strength of grip in boys shows a marked accentuation in its rate of increase, and this increase continues as far as our observations extend, viz., to the age of twenty. In girls no such great accel-

eration in muscular strength at puberty occurs, and after sixteen there is little increase in strength of grip. The well known muscular differentiation of the sexes practically begins at thirteen.

12. As with strength of grip, so with endurance as measured by the ergograph, boys surpass girls at all ages and this differentiation becomes very marked after the age of fourteen, after which age girls increase in strength and endurance but very slightly, while after fourteen boys acquire almost exactly half of the total power in these two features which they acquire in the first twenty years of life.

13. The development of vital capacity bears a striking resemblance to that of endurance, the curves representing the two being almost identical.

MEASUREMENTS OF PUPILS AT THE AGE OF PUBERTY AND ADOLESCENCE.

Dr. W. S. Christopher, of the Child Study Department of the Chicago Public Schools, aided by several experts, measured some 6,259 children of the Chicago schools, 2,788 boys and 3,471 girls. The charts and methods employed may be seen in the Journal of the American Medical Association, September 14, 1901. Some of the results were known before, but may be repeated here.

From the age of nine to eleven and twelve boys tend to show a period of relative quiescence in growth; from eleven to seventeen, however, there is a period of accelerated growth. The curve for girls shows a less well-marked quiescent period, a better marked and shorter growth. The sharp increase in growth of boys at eleven and twelve has a corresponding parallel in the growth of girls a year earlier.

There is an exaltation of life processes at the pubertal period which finds its expression not only in an increased rate of growth, but also in the development of physical power. This exaltation is preceded by a period of relative quiescence.

The range of the measurements show a normal variation of considerable extent in the growth of both boys and girls, but slightly more marked in the case of girls. The growth is not quite regular, showing considerable individuality in each case. The variation of range occurs a year earlier in the case of girls. While puberty is a period of great exaltation of life processes it is also a period of great individualization. It is a time when the weak fail and the able forge to the front.

The well-known law of Axel Key, that mortality and disease are less at puberty than at any other period of child life, is to be explained as the result of these accelerated life processes. The neuroses, psychoses, neurasthenias, the passions and the vaulting ambitions characteristic of puberty are the principal morbid manifestations of the rapid physical changes of the body. The lack of steady balance has its counterpart an the physical side. Rapid increase in stature associated with deficient nutritive supply is commonly productive of stoop, muscular atrophy, depression, fatigue, irritability and inability to sustain control exercised by others.

The article of Dr. Christopher is especially noteworthy for the emphasis it places on the great individualization of puberty as indicated by the great normal range of physical measurements at this period.

FATIGUE.

Dr. Giuseppe Bellei, of the Municipal Hygienic Department of Bologna, from his investigations, has arrived at results which correspond with other results obtained by similar researches in this country and abroad.

He examined carefully by the dictation method 460 pupils (average age eleven years and six months) belonging to the fifth elementary class in the public schools of that city. There were six dictations for each child, given at the various hours of the school day, taking from twenty to twenty-five minutes. The chief conclusions arrived at are as follows:

1. No evidence as to the diverse fatigue-influence of the various subjects of instruction is forthcoming.
2. The first lesson-hour is a useful mental exercise if the pupils during that time succeed in arousing themselves from the disattention under the influence of which they are when they enter school.
3. The morning school does not produce notable mental fatigue.
4. The noon rest is very useful to the pupil since it does not destroy the good effects produced by the mental exercise of the morning, and renders him capable of better work than he is able to give after a prolonged rest, as observed when entering school.
5. In spite of the fact that immediately after the noon rest the pupils are in the best conditions of mind, an hour or a little more of school in the afternoon is sufficient to induce so much mental fatigue as to cause, at the end of the afternoon's lessons the worst work of the whole day.

The general statement seems justifiable, therefore, that, if the morning school does not fatigue, it exhausts the mental resistance of which the pupil is capable to such an extent that he is unable to undergo even brief mental labor during the afternoon without exhibiting the most evident signs of notable fatigue.

It may be added that music seems admirably adapted as the first preliminary morning exercise to secure the mental attitude of attention for the morning's work and that motor exercises, manual training, etc., are displacing the usual recitation work. (1)

RURAL SCHOOLS.

(From Report of Professor Robertson, Commissioner of Agriculture for Ontario, on his investigation of the consolidation or centralization of rural schools in Ohio.)

Six years ago Gustavus township became the pioneer in that part of the United States in the consolidation of rural schools. There were nine school districts in the township and as many small schools. Then the districts were united into one, and a central school was erected at a cost of $3,000. It is a frame building, containing four large, well-lighted class rooms, a small recitation room and cloak rooms. Instead of nine teachers in little isolated schools, there are now

(1) A. F. Chamberlain, in an article in the Pedagogical Seminary, June, 1901, on Some Recent Anthropometric Studies.

a principal at a salary of $65 per month, and four assistant teachers at $32 or $30 per month in the united school. Nine nice-looking vans are used to convey the children from and to their homes. These wagons or school vans have comfortable seats, running lengthwise of the vehicle, waterproof canvas covers and spring gearings. Before consolidation the average attendance at the schools in that township was 125. On the day of the visit by the three Canadians it was 143 out of an enrollment of 162. The year before consolidation the cost of maintenance of the nine schools of the township was $2,900. Four years afterwards the cost of the centralized schools, including the conveying of the children, was $3,156, being an increase in expenditure by the township on its school system of $256. However, the average attendance at the central school was so much greater than at the single district schools that the cost of education was decreased $1.59 per pupil on the average attendance.

Moreover, three years of high-school work is carried on in the consolidated school, and the total cost of that is included in the $3,156.

The contracts for conveying the children to and from the schools are given to responsible persons. These are under bond to provide comfortable covered wagons and to comply with the regulations of the school authorities. The vans hold from fifteen up to over twenty-five. The longest route traversed was about six miles. The vans arrive at the school at from ten to twenty minutes before 9 o'clock, the hour at which the forenoon session begins. The afternoon session closes at half-past 3 o'clock. At Johnston school, where the closing exercises were observed, the children were in the vans starting for their homes in less than five minutes afterwards. At Kinsman, the eight vans are engaged at an average cost of $2.07 per school day; at Gustavus, the nine vans at an average of $1.25, and at Johnston the ten vans at an average of $1.27. The price of the vans was from $100 to $135 each. All the vans observed were drawn by two horses each. The drivers who were conversed with said they had not known of any injury to any child. They said the regulations required them to wait for the children at any house for a period not exceeding two minutes, that as a matter of fact it was rarely necessary to wait one minute, and that a case where the children missed the van or were left from being late was very uncommon. The average attendance at the schools confirmed all that.

About 5 per cent. of the pupils preferred walking to the old school rather than riding in a van to the new school. Almost without exception these were pupils who now have four to six miles of a drive in place of a former walk of one mile or less. At the same time these pupils expressed a decided preference for the work of the consolidated school. The evidence of both pupils and teachers goes to show that riding in the vans is alike comfortable and free from injury to even the youngest children. The increased enrollment of pupils and the very high percentage of regularity in attendance struck the visitors as remarkable. For the past three months the daily average attendance at the Kinsman school, which is in that respect typical, was 91 per cent. of the number of pupils enrolled. More striking in this connection is the fact that the percentage of regular attendance among the youngest pupils—those of five, six and seven years—was as high as that of any other class.

Although the weather was rainy and the roads as bad as three inches of snow mixed with mud could make them, the children jumped out of the vans at Kinsman school with dry clothing and dry feet. Little boys and girls of six years came three and four miles in comfort. The teachers said they came regularly in all weathers. Under the small district system in the township of Kinsman two years before, the enrollment at the schools was 110; under the consolidated system it has risen to 146, without any appreciable difference in the total enumeration of children in the township. The high percentage of young children (six to eight years) and the large proportion of older pupils (from fifteen to twenty years) were eloquent of the gains in education during the first two and the later years of school life in a rural district.

The large class and larger schools seemed to meet the social needs of the children better than the small isolated schools. The older boys and girls grown into young men and women had opportunities for going on with a high school education without going away from home. There was said to be, and there appeared to be, a great development of a spirit of co-operation and of mutual good will and friendship from the wider and closer acquaintance of the children of the locality, and from the new interests created and recognized as being common to all, and for the common good.

As far as could be learned, there was almost entire unanimity of opinion among the ratepayers respecting the marked success and superior advantages of consolidation. While the scheme was brought into effect under vigorous discussion and considerable opposition, the adverse criticism has been disarmed by the results of experience.

With few exceptions, the "kickers," as they are designated locally, were ratepayers without children, or persons who feared some depreciation in the value of their own property; or, worse still, some increase in the value of the property nearest to the centralized school. Experience has proven the former of these two fears to be groundless and childish.

Professor Robertson sums up some of the advantages afforded by the consolidation of rural schools and the free transportation of pupils:

1. It results in the attendance of a larger number of children in the locality, particularly of those under the age of eight years, and of those over fifteen years.

2. It brings about a more regular attendance of pupils of all grades of advancement.

3. It ensures the engagement and retention of some teachers of higher qualifications and longer experience in rural schools.

4. It creates conditions for a proper classification of pupils and for such a grading of the schools as permits the pupils to be placed where they can work to the best advantage for their own improvement.

5. It permits the time-table to be so arranged that teachers can give each class and every pupil in the class more direct help and supervision.

6. It provides the beneficial influences of fairly large classes of pupils of about equal advancement: (a) by more companionship; (b) by friendly rivalries to excel; (c) by children learning from each other; (d) co-operating under careful discipline, and (e) by class enthusiasms.

7. It makes it convenient for boys and girls in rural districts to obtain a high-school education without leaving home.

8. It leads to the erection of better school buildings and more satisfactory equipment in all the requisites of a good school.

9. It makes it practicable for rural schools to enrich their course for all pupils by nature study, manual training and household science, as well as by better music; and for advanced pupils by instruction in agriculture, horticulture and allied subjects.

10. It stimulates public interest in the schools and brings to the people of a township an institution in which all can have an equal interest and a worthy pride.

11. It may lead to an improvement of the public roads in the country parts.

12. It would facilitate the rural free delivery of mail.—Montreal Witness, Dec. 23, 1902.

SOME NEW EDUCATIONAL THESES.

The address on the "American University" recently read by Professor J. McKeen Cattell, of Columbia University, before the Phi Beta Kappa of Johns Hopkins, has a combination of sense, audacity and breeziness that amounts almost to a gale. For example, he says: "Ten years of age is early enough to begin to read, write and calculate; primary education should be chiefly for the formation of motor habits; a child's head will not hold more miscellaneous facts than can be injected in a year or two; he can learn nearly as much of his present scholastic studies in two hours a day as in eight. If the required school attendance for each child were reduced to one-half or one-third, then, without additional expense, the fewer buildings and smaller equipment might be doubled or tripled in value, and the salaries of teachers might be doubled or tripled. The best trained teachers, more men than women, should be in charge of the younger children. If society must develop a class similar to the neuter insects, it should not have charge of the education of children. The boy should stay in the high school until he is eighteen, and then go to the university, or he should enter the college at sixteen and pass forward to the university in two years. The man should begin to take part in the real work of the world at twenty-one, but he should never regard his education as complete, and should for many years, if not always, continue to spend some time in work at the university. * * *

"In my opinion the university is, or should be, a group of professional schools, giving the best available preparation for each trade and profession. It is more feasible to give such training than to teach culture and research. These, like the building of character, are not the result of any particular kind of curriculum. Culture comes from daily and immediate association with the best that the world has; and this should be found at the university. * * *

"The chief difficulty in securing the right men for university chairs is the small field from which they must be drawn. When we have a hundred thousand men of university training teaching in the schools, there will be those deserving promotion. When we have more students doing research work at the universities, there will be more men of genius for the higher offices. * * * We should,

without delay, introduce the *privatdocent* system of Germany."—E. C. H., American Journal of Sociology, July, 1902.

MILITARY EXPENSES IN TERMS OF EDUCATION.

The meaning of the promised reduction of the military force in the Philippines to 18,000 men may be better appreciated, perhaps, when it is stated in terms of education. To support an American army on a peace footing costs something over a thousand dollars per man. Warlike operations, of course, cost more. Every regiment of a thousand men, therefore, is equivalent in expense to a university like Columbia. Nine thousand men on garrison duty in the Philippines, making no allowance for campaigns, use up as much money as all the colleges and universities in New England and the Middle States combined, including Harvard, Yale, Columbia, Cornell, Princeton, the University of Pennsylvania and Johns Hopkins. When the promised reduction is made we shall have brought home 52,000 men from our Philippine army in a little over two years. That means a saving two and a half times as great as the cost of maintaining all the universities and colleges in the United States, and one-third as great as the combined salaries of all the public school teachers in the country. Even those who are most convinced of the necessity of our presence in the Philippines will be glad to see this shrinkage in the bill. We are not a military people, and we think that we are particularly partial to education. It may surprise some of us to know that we spent last year in round numbers six times as much for the army, four times as much for the navy and seven times as much for pensions as for higher education, and that the aggregate of our expenditure for these three military objects was about twice our total outlay on education of every kind, from the kindergarten to the university.—Harper's Weekly.

REVIEWS OF IMPORTANT BOOKS.

J. A. Hobson, The Social Problem, New York, 1902 (James Pott).

In this work by J. A. Hobson, certainly the most original of political economists in England today, many new and rich suggestions are offered which have a decided bearing on educational theory, as well as on the problems of political economy. Only a few points can be emphasized here.

First, society is the maker of "values." The claims of Herbert Spencer and other"individualists" that property and other values are the results of the labor of individuals and therefore their rightful possession, are denied on the ground that such values are not the exclusive products of individuals, as such. They are not attained through merely individual agency. They are the result of the social labors of the past, of the aid rendered by social institutions, of the many co-laboring social agencies of which one particular individual is but the agent or expression. They, therefore, represent co-products. The family assists, the neighbors lend their aid, co-specialists are necessary in every unit of work. The "unearned increment" is due to the labor of others. The rise and fall of prices and the law of supply and demand are pre-eminently social factors. Inspiration, ambitions and ideals are factors, and very important ones at that, in the economic life of individuals. Whence their origin unless from community life, past and present, the life of social co-operation?

Secondly, property and rewards should, in the final analysis, be distributed not according to work done, but according to needs. To the individualist of the old school this is heresy indeed. If values are social products, if each man's product is a communal result, if, and this is the main point, the needs of society are paramount, then each laborer should be provided with just so much and no more, as will make that laborer most productive and most useful to the society in which he lives. How to elevate each producer to the highest degree of social efficiency, that is the problem. Has he worked for it? Have the pupils of our schools "earned" the educational facilities we afford them so generously? Have the poor and the inhabitants of our slum districts "earned" the provisions we make for their amelioration? That is not the question. *Social utility*, not only for the present, but also for the future, is the standard according to which all efforts, all reward, all remuneration must be gauged. Society has done this it is true heretofore, but unconsciously. We are now becoming deliberately conscious of our efforts with a much greater chance for more successful adaptation in the future. This same principle of distribution according to needs, not for charitable purposes, but for reasons of social utility, holds as well for other fields of human effort as for the field of economics. Criminal jurisprudence and school discipline must inevitably come under the sway of this great governing principle. The crime or offense must be punished, so runs the traditional judgment expressed in most emphatic terms. We forget that if a mother's tears or Christ's love do reform the

offender, they are sufficient punishment. If physical castigation is necessary to reform the criminal, then let it be "distributed according to his needs." If good food or industrial training is necessary, then let the "punishment" take that form. We plead for this principle as an ultimate standard. At the same time we are not forgetful that, as a secondary matter for consideration, the *means* employed in judging of the proper distribution of rewards may well be, in many cases, the actual services hitherto performed; but this is not always possible, as, for instance, in the education of the young or of the criminal.

Karl Groos, The Play of Animals, Appletons, New York, 1898. The Play of Man, New York, 1901.

These works were critically reviewed in the preceding number of the *Investigations*, but on account of their exceeding importance they are recommended very earnestly for perusal and study by all who have not yet had the pleasure of reading them. They mark an epoch in the scientific study of this important subject. Not content with bare speculative *a priori* statements, Prof. Groos has laid the foundations in an inductive study of the phenomena of play of one of the most important topics in the science of education, and also of a more solid superstructure in the realm of æsthetics. The mass of facts packed and arrayed in splendid numbers are sufficient of themselves to have gained for the author an enviable reputation, but in addition to this a most thorough discussion has arisen which promises to bear rich fruit in the future. None interested in the scientific study of education can talk intelligently on the subject without having read these two works.

Th. Ribot, Evolution of General Ideas. Open Court Pub. Co., Chicago, Ill.

This work of Ribot's, the best yet published on the subject of Concepts or general ideas, is psychological rather than logical. It is a worthy successor of Locke, Berkeley and Hume, It demonstrates clearly that there is no one imagination but many; that a concept may be of many kinds, auditory, visual, motor, olfactory, etc.; that a concept is symbolic in that the mental presentation in question is a sign or symbol of much potential knowledge, which may be aroused by association at any time. Ribot discusses the evolution of the concepts of number, time, space, cause, etc.

H. G. Wells, Anticipations of the Reaction of Mechanical and Scientific Progress upon Human Life and Thought. Harper & Bros., 1902.

Many forecasts are made of social evolution based generally on safe scientific grounds. Mr. Wells curbs his Haroun al Raschid imagination and deals with probabilities instead. It is fertile, suggestive reading and optimistic withal.

Increased facilities for locomotion in the twentieth century will be responsible for the probable diffusion of great cities. The general distribution of population in a country must always be directly dependent on transport facilities. Many incidental suggestions are made of a causal nature, such as the various reasons for the present form of railway power and transport. Many of the anticipations would have more promising validity if they had been backed up and supported by statistical studies of the actual growth of certain tendencies within recent times. Thus, *e. g.*, the utilization of nature's forces—the bringing in of mill-

ions of unseen slaves for the service of man—is well illustrated by the last U. S. census.

Judging by the amount of power used, manufacturing in the United States has almost doubled in ten years, and it is five times greater than it was thirty years ago. Here are the figures from the census reports:

Year.	Horse Power.
1900	11,300,000
1890	5,954,650
1880	3,410,837
1870	2,336,142

These vast amounts do not include the power used for other purposes than manufacturing, such as transportation and lighting. More than 1,000,000 horse power was used in the power houses of the 1,200 electric railroads in operation in 1900, and more than 1,500,000 horse power was used in generating electricity for the 3,300 lighting and power distributing stations. More than 350,000 horse power is employed for this purpose in New York City alone.

Of the total power used in manufactures during the census year steam engines furnished 8,742,416 horse power, or 77.4 per cent. of the aggregate; water wheels supplied 1,727,258 horse power, or 15.33 per cent.; electric motors, 311,016 horse power, or 2.7 per cent.; gas and gasoline engines, 143,850 horse power, or 1.3 per cent. and other forms of mechanical power 54,490 horse power, or five-tenths of 1 per cent. Rented power was used to the extent of 321,051 horse power, or 2.8 per cent. of the total. Of this rented power 183,682 horse power was electric and 137,369 horse power was from other sources of energy.

The modern office building, often housing a population equal to that of a small town, is almost wholly a creation of the last ten years, and the power required in these great structures forms a large item when the number of these buildings in the United States is taken into consideration, as about 1,000 horse power is required to operate the lighting plant, elevators, pumps, compressors and ventilators in a 16-story modern building containing 560 offices.

New York leads the list of states in the use of water power, having 368,456 horse power derived from this source in 1900, against 233,795 in 1890, an increase of 134,661 horse power, or 57.6 per cent. directly traceable to the great expansion of the wood pulp industry in the State.

The influence of mechanism on the serf, peasant and laboring classes, on tranportation, political union, the organization and conduct of states, commerce, the growth of joint-stock companies and their necessary consequence, the trusts and municipal or social control, finance, growth of democracy, the growth of specialized classes, etc., etc., is all ingeniously investigated. The charm of a fine style adds its glamour to the natural fascination exercised over us by all anticipations.

American Engineering Competition, A Series of Articles Resulting from an Investigation by a Correspondent of the London "Times." Harper Bros., N. Y., 1901.

This series of letters published in The Times by an English engineer aroused very considerable comment on both sides of the water. The author describes the

size of the factories, the completeness of manufacturing plants, the way the men work, the enterprise of employers and the natural resources of the company. He points out those qualities in American business life which have practically won for them commercial supremacy. The whole work is full of excellent things. Few books are more conducive to the teaching of patriotism than this one. Future patriotism will be taught and inculcated by such scientific books as these rather than by the sentimental nonsense now so largely used.

Hodge, Nature Study and Life. Ginn & Co., 1902.

This is no common school-book. One seldom reads a book of greater genuine power and inspiration. Not one page is a conventional following of uncriticized inheritances; not a line but breathes of living original personal feeling; yet never once does the book fail to impress the reader with the authority of profound modern scholarship. "Nature-study," according to this book, "is learning those things in nature that are best worth knowing, to the end of doing those things that make life most worth the living." All through there is a full-breathed hardihood of optimism as unconscious as a child's health. The love of nature revealed here is of the true breed, free from affectation or afterthought, like a bird's song or a boy's whistle. There is a naive inward cleanliness about the book that reminds one of great poetic genius. One would say that the writer had in his own way come to the view of Wordsworth and of Shakespeare's *Cymbeline* and *Winter's Tale* that Nature can herself form hearts and winds more sweet, strong and perfect than the best art. "To apprehend thus draws us a profit from all things we see." " 'Tis wonder that an invisible instinct should frame them to royalty unlearned, honour untaught, civility not seen from other, valour that wildly grows in them, but yields a crop as if it had been sow'd." Strength and gentleness for boys, gentleness and strength for girls, these rather than literary refinements, or emotional excitements are the end aimed at by "Nature-Study and Life." The author seems a magician making paradoxes easy. The word "practical" seems synonymous with "poetical" in his diction. There is an almost religious love for plants and insects breathing through the most matter-of-fact phrases, and one almost wonders whether the author knows the gift he brings to poorer souls.

One can imagine Wordsworth looking down upon this new movement with pride. His exquisite verses describing a girl formed by nature seem to be becoming accepted as a guide for school-teachers.

"She shall be sportive as the fawn.
That with wild glee across the lawn,
    Or up the mountain springs;
And hers shall be the breathing balm,
And hers the silence and the calm
    Of mute, insensate things.
The floating clouds their state shall lend
To her; for her the willow bend;
    Nor shall she fail to see
Even in the motions of the storm,
Grace that shall mould the maiden's form
    By silent sympathy.

The stars of midnight shall be dear
To her; and she shall lean her ear
    In many a secret place,
Where rivulets dance their wayward round,
And beauty born of murmuring sound
    Shall pass into her face.
And vital feelings of delight
Shall rear her form to stately height,
    Her virgin bosom swell;
Such thoughts to Lucy I will give
While she and I together live
    Here in this happy dell."

So spake Nature according to her deepest interpreter: and one may say that Wordsworth's poetry and Hodge's idea of "life" coincide.

The book is different from any other on the subject. With the confidence of a scientist of acknowledged position the author has been as bold in discarding technical learning as Baldwin was in his *Story of the Mind*, in this book meant for children. It is the richest and most interesting book of the kind, the best adapted to the various periods of development in children, the most profoundly right in pedagogy, and the most free from the ineffective will-lessness of books straining after pretty literary effects, that one could desire. But to end where we began, the quality that makes this book a service to the republic is an amazing unconscious magic distilled out of a splendid original personality which sees no distinction between practical and poetical, between the common earth and sky and the divine being that it is, and that is it, and that therefore knows no divorce between sentiment and volition, and tends to reproduce itself in a race of gentle giants fit for all offices of an indeal land and race. A few more decades of this fruitful pedagogy and we shall begin to see our way out of the woods and the shadows of mediævalism and to boast of the beginning of a true Renaissance.

Commercial Geographics. (1)

Dr. H. R. Mill, President of the Geographical Section of the British Association for the Advancement of Science (1901), defines geography as "the science which deals with the forms of relief of the earth's crust, and with the influence which these forms exercise on the distribution of all other phenomena," and he divides the subject into: (1) Mathematical geography, which regards the earth as a spinning ball lighted and warmed according to a rigid succession of diurnal changes. (2) This merges into physical geography which is concerned with the contemporary changes in the crust and in the surrounding fluid envelopes. (3) Bio-geography or the geographical distribution of life, and finally (4) Anthropogeography or the relation of man to the earth's crust, a subject which must be separated for the more general third division on account of the number of exceptions it presents to the laws governing the distribution of the lower forms of animal life and on account of the exceptional powers possessed by man for modifying the conditions of the earth's surface.

(1) Adams, A Text-Book of Commercial Geography, Appleton's, N.Y., 1902. Olin, Commercial Geography, Crane & Co., Topeka, Kansas, 1902.

One of the most promising signs of the times is the newer and improved type of text books now being published by our leading firms. Outside the natural sciences the text books in geography probably have improved most rapidly. Physical geography has done good pioneering work and now comes commercial geography. A great advance has been made when a comparison is made with the older descriptive geographies. Causal conditions are now emphasized and a truer appreciation of the control exercised by economic factors in human history is becoming general throughout the population. A splendid future awaits the teaching of commercial geography in our schools.

At the same time improvements are certainly possible. For instance, instead of treating each country *seriatim* after the fashion of the older descriptive geographies, each industry might be considered more or less by itself with its various ramifications, dependent or superior industries, necessary conditions of growth or decay, etc. The life history of an industry with its social causes and effects and historical setting would be of inestimable value. Fewer industries could be treated and these more thoroughly. The encyclopædia-effect of certain text books would then be avoided. The causal habit would then be engendered and the memory left free for correlated facts. If such a method of treatment were adopted there would be a much closer connection established between pedagogic methods and the actual conditions of social life. The study of commercial geography would be one of the most humanistic of all studies.

Another suggestion which might be made is that as soon as possible some approach must be made to the laboratory method. Vast mountains of facts bewilder and confuse the students. Only that which is sought for and connected together in one system of search and thought tends to remain as useful acquisitions. Such a suggestion is, however, in the present state of geographical and historical equipment, more easily made than carried out.

Adams' book—one of the Twentieth Century text books—is certainly one of the best ever published. It is replete with the right kind of information and the author shows a very complete mastery of his subject. It is a decided improvement on its predecessors of a similar nature.

Olin's book is more elementary than that of Adams' but equally good. It is also arranged with great pedagogic insight. The author and publisher are to be congratulated on getting out such a suitable work.

Causal Geography. (1)

The light which geography throws upon history is being recognized more and more by our teachers, much to the benefit of pedagogics in general. The works of Ratzel, Ihering, Kirchoff, Hann, Dorn and a score of other writers are enriched by another, Mr. H. B. George of Oxford. His present work is an attempt to provide still more data for the explanation of history, mainly political history, by means of geographical influences. Man cuts canals and tunnels mountains, drains marshes and constructs artificial harbors, but it must be admitted that these things are trifles compared to the steady operation of geographical causes

(1) H. B. George. The Relations of Geography and History, Oxford, Clarendon Press, 1901.

throughout all history. The book is another evidence of the irresistible march of *causal geography*, and as such it ought to be in the library of every High School and in the hands of every teacher of history. The following is a fair sample of the tenor of the whole book:

"The vast region of the Pinsk marshes protected a great part of Russia in 1812; if a new Napoleon invaded Russia now, he would not have his operations limited to a portion of the western frontier. The clearing of forests seems to have permanently affected climate in many regions. The construction of harbor works, besides assisting commerce, has modified geographical conditions under which maritime war is waged. The Kiel canal greatly increases the practical naval strength of Germany, by rendering it possible to move ships securely between the Baltic and the North Sea, instead of their being compelled to make the circuit of Jutland and pass through the Sound under the guns of a foreign, perhaps hostile, power. The cutting of the isthmus of Suez has almost revolutionized one-half of ocean commerce, and has modified profoundly many political conditions which depend on geographical facts. But for the Suez canal, England might, in view of the great improvement in speed of ocean voyages, have been content with the Cape route to India for all purposes except passenger traffic. As it is, she has been compelled to retain a hold on Egypt; and the whole balance of power in the Mediterranean, the geographical conditions affecting possible war in that sea, are deeply affected thereby."

J. Laurence Laughlin, The Elements of Political Economy, with Some Applications to Questions of the Day. American Book Co., 1902.

This is probably the best book for High Schools on Political Economy yet published for American schools. It presents in a plain and simple form the elementary principles of political economy. It leads the pupil to think causally and to investigate for himself. The treatment of the fundamental laws is clear and adequate and well illustrated by excellent example.

Scientific Memoirs. Edited by Joseph S. Ames, Professor of Physics and Director of the Physical Laboratory, Johns Hopkins University. Fifteen volumes, bound in cloth, about 150 pages each, prices varying from 60 cents to $1.00 per volume. (New York: American Book Co., 1898 to 1902.)

This is a physical classic series, consisting of translations or reprints of memoirs of the discoverers in Physical Science from its rise to the present day. Each subject is treated in one volume and has a separate editor. The editor has selected memoirs and parts of memoirs bearing on the subject, adding notes from his own hand for connection and elucidation. Each volume also contains a short preface, chiefly historical, and a short biographical sketch of each of the writers from whose memoirs he has selected. References to allied papers are found in a bibliography at the end of each volume.

It is refreshing to note this departure. Excessive reliance upon text-books has been too much the order of the day instead of a liberal use of the scientific classics themselves. Probably the pressure of examinations has had a good deal to do with this unfortunate slavery to one text. Too much cannot be said in

praise of this series. It ought to be in the reference library of each High School and the property of each teacher of physics and chemistry.

The series offers no mathematical difficulties to the average reader and presents, on the whole, delightful reading to any one at all interested in the subjects treated. Following is a list of the memoirs:

The Free Expansion of Gases. Memoirs by Gay-Lussac, Joule, and Joule and Thomson. Edited by Dr. J. S. Ames, Johns Hopkins University.

Prismatic and Diffraction Spectra. Memoirs by Joseph von Fraunhofer. Translated and edited by Dr. J. S. Ames, Johns Hopkins University.

Roentgen Rays. Memoirs by Roentgen, Stokes, and J. J. Thomson. Translated and edited by Dr. George F. Barker, University of Pennsylvania.

The Modern Theory of Solution. Memoirs by Pfeffer, Van't Hoff, Arrhenius and Raoult. Translated and edited by Dr. H. C. Jones, Johns Hopkins University.

The Laws of Gases. Memoirs by Boyle and Amagat. Edited by Prof. Carl Barus, Brown University.

The Second Law of Thermodynamics. Memoirs by Carnot, Clausius and Thomson. Translated and edited by Prof. W. F. Magie, Princeton University.

The Fundamental Laws of Electrolytic Conduction. Memoirs by Faraday, Hittorf, and Kohlrausch. Edited by Dr. H. M. Goodwin, Mass. Institute of Technology.

The Effects of a Magnetic Field on Radiation. Memoirs by Faraday, Kerr and Zeeman. Edited by Dr. E. P. Lewis, University of California.

The Laws of Gravitation. Memoirs by Newton, Bouguer, and Cavendish. Translated and edited by Prof. A. S. Mackenzie, Bryn Mawr College.

The Wave Theory of Light. Memoirs by Huygens, Young, and Fresnel. Translated and edited by Prof. Henry Crew, Northwestern University.

The Discovery of Induced Electric Currents. Vol. I. Memoir by Joseph Henry. Edited by Dr. J. S. Ames.

The Discovery of Induced Electric Currents. Vol. II. Memoir by Michael Faraday. Edited by Dr. J. S. Ames.

The Foundations of Stereo-Chemistry. Memoirs by Pasteur, Van't Hoff, Le Bel and Wislicenus. Translated and edited by Prof. G. M. Richardson, Leland Stanford, Jr., University.

The Expansion of Gases. Memoirs by Gay-Lussac and Regnault. Translated and edited by Dr. W. W. Randall, Mackenzie School.

The Laws of Radiation and Absorption. Memoirs by Prévost, Stewart, Kirchhoff, and Bunsen. Edited by Prof. D. B. Brace, University of Nebraska.

Bancroft, Jessie H., School Gymnastics. Free Hand. D. C. Heath & Co., Boston, 1901; Ibid, School Gymnastics, with Light Apparatus. D. C. Heath & Co., Boston, 1901.

The place of gymnastics in the school curriculum seems to be well assured. In addition to the motor and mental training to be secured from manual training and from play activities there is certainly much to be acquired from a well-developed system of gymnastics. The field of gymnastics may possibly in the future be more limited when manual training is better developed and when play activities are more scientifically studied and scientifically controlled, but until that day gymnastic exercises can hardly be over-emphasized. As Miss Bancroft claims in her excellent introduction, three objects are to be attained by physical exercise: stimulation of nutritive functions, correction of posture, and a general, basic training of some of the psychological powers, particularly of the will.

This is largely defensive warfare, a combat with adverse influences and that is one of the weak points about gymnastic training. It is excellent from a pathological standpoint. The right kind of motor training is obviously, however, that kind of a training in which a social aim is to be achieved, in which there are necessarily involved adaptations of means to ends, and, finally, in which the instructive and developing characteristics of the child act as grooves along which training will take its way to the ideal.

Miss Bancroft has done most excellent work in these volumes. Neither the Swedish nor the German systems have been slavishly adopted, but the characteristics of these systems suitable for our American schools have been utilized.

The publishers have issued the books in perfect form.

Herbert Spencer, Facts and Comments. Appleton & Co., N. Y., 1902.

This, the last work to be issued by Herbert Spencer, has been called the swan-song of the philosopher. A truly gigantic worker has said his last word. Regret is merged into triumph, however, when one considers the great work accomplished and the amount of influence exerted by this one man. True he was the expression of his age, but still he was one of the few greatest men of that age.

Facts and Comments contains many valuable utterances and many suggestions for further thought. Mingled with these are views which, to say the least, are not in harmony with the age, but it may well be that in many cases the aged seer may be wiser than we know. Stern advocate as he is of *laissez-faire*, one is not surprised to see him deplore state education, vaccination, state-aided enterprises, party government, etc. These essays are well worth reading, nevertheless. They are full of suggestions. There runs throughout education at large the pestilent practice of starting with the abstract and ending with the concrete —a practice utterly at variance with the course of mental development, which starts with the concrete and ends with the abstract. The forcing grammar-lessons on children affords perhaps the most glaring illustration. But those whose mental culture is carried to a high stage may properly enter upon the study of grammar as a preliminary to the study of logic. Both concern the co-ordination of the ideas which constitute coherent thinking.

ident G. S. Hall from the list of modern biographies. The information contained is usually quite up to date.

Long, Wm. J. Ways of Wood Folk, Ginn & Co., Boston, 1902; Wilderness Ways, Ginn & Co., Boston, 1901; Secrets of the Woods, Ginn & Co., Boston, 1902.

These delightful studies of wood-life cannot be too highly commended. Good for children they are good also for the so-called grown-up. The *Secrets of the Woods* must have had the fascination for the author which all boys have had at some stage in their development. The sketches are taken almost at random, so the author tells us, from old note-books and summer journals. About them gather a host of associations, of living-over-agains, that must have made it a delight to write them out and a delight to read them, associations of the winter woods, of apple blossoms and nest-building, of New England uplands and wilderness, rivers, of camps and canoes, of snow-shoes and trout rods, of sunrise on the hills, when one climbed from the eagle's nest, and twilight on the yellow, wind-swept beaches, where the surf sobbed far away, and wings twanged like reeds in the wind swooping down to decoys—all thronging about one, eager to be remembered.

Bretherton, Ralph H., The Child Mind. John Lane, New York, 1903.

A delightful presentation of the child mind in a manner half-autobiographical and wholly literary. It is charming from beginning to end and true to nature. The dainty description of certain phases of pathos, passion and wide-eyed wonder is excellent. The hard-headed and calloused adult is rejuvenated by a look behind the curtains at the real world of youth. It may incidentally do him good.

VOL. I. NO. 4

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ADDRESSES OF PUBLISHERS.

[When in doubt as to the character of any of the books recommended in this catalogue, school boards and teachers should communicate with the publisher. In some cases, publishers are willing to send books on approbation, and, in all cases, they are willing to supply full particulars.]

The following list contains the addresses of a number of the best publishers:

Alden, John B., New York.
Allyn & Bacon, Boston and New York.
Altemus, Henry, Philadelphia.
American Book Co., New York.
Ames & Rollinson Co., New York.
Appleton, D., & Co., New York.
Arnold, Edward, London.
Athenæum Press, Ginn & Co., Boston.
Barnes, A. J., St. Louis, Missouri.
Bell, George, & Sons, (Bohn), London.
Bender, Brewar & McGurrin, Grand Rapids, Mich.
Black, Adam & Charles, London.
Blackie & Son, London.
Blackwood, William, & Sons, Edinburgh and London.
Blades, East & Blades, London, Eng.
Blakiston's, P., Son & Co., Philadelphia.
Briggs, William (The Methodist Book Room), Toronto.
Burrows Bros. Co., Cleveland, Ohio.
Business Educators' Publishing Co., London, Ont.
Cambridge Press, Macmillan Co., New York.
Cassell & Co., New York.
Century Co., New York.
Chambers, W. & R., London and Edinburgh.
Chapman & Hall, London.
Chatto & Windus, London.
Christern, F., & Co., New York.
Churchill, J. & A., London.
Clarendon Press, Oxford.
Coates, Henry T., & Co., Philadelphia.
Comstock, Wm. T., 23 Warren St., New York.
Copp, Clark Co., Toronto.
Crowell, T. Y., & Co., New York.
Dawson Bros., Montreal.

Dent, J. M., & Co., London.
Dodd, Mead & Co., New York.
Donoghue, M. A., Chicago.
Doubleday, Page & Co., New York.
Douglas, David, Edinburgh.
Drysdale, W., & Co., Montreal.
East and Blade, London.
Eddis, W. C., Toronto, Ont.
Educational Publishing Co., Boston.
Fleming, C., Owen Sound, Ont.
Funk & Wagnalls Co., New York and London.
Gage, W. J., Co., Toronto Canada.
Gee & Co., London.
Gill, George, & Sons, London.
Ginn & Co., Boston and New York.
Goodwin, J. H., 1215 Broadway, New York.
Griffin, Chas., & Co., London.
Harper & Bros., New York.
Hazel, Watson & Viney, London.
Heath, D. C., & Co., Boston.
Henley, Norman W., & Co., New York.
Holt, Henry, & Co., New York.
Home Science Pub. Co., Boston.
Houghton, Mifflin & Co., Boston and New York.
Hurst & Co., New York.
Isbister & Co. London.
Johnson, W. & A. K., London and Edinburgh.
Kegan Paul, Trench, Truebner & Co., London.
Kellogg, E. L., & Co., New York.
Lee & Shepard, Boston.
Lippincott, J. B., Co., Philadelphia.
Little, Brown & Co., Boston.
Longmans, Green & Co., London and New York.
Lothrop Publishing Co., Boston.
Lovell, John, Montreal.
Lupton, F. M., Pub. Co., New York.
Macmillan Co., London and New York.
McClure, Phillips & Co., New York.
Maynard, Merrill & Co., New York.
Methodist Book Concern, New York.
Methuens, London.
Mitchell, C. W., Ottawa.
Morang, George N., & Co., Toronto.
Munn & Co. (Scientific American), New York.
Murray, John, London.
National Educational Association, University of Chicago Press.

Nelson, T., & Sons, London, Edinburgh and New York.
Newnes, George, London.
Nimmo, W. P., Hay & Mitchell, Edinburgh.
Open Court Pub. Co., Chicago.
Orange Judd Co., New York.
O'Shea, J., New York.
Powers & Lyons, New York.
Prang Educational Co., Boston, Mass.
Putnam's, G. P., Sons, New York.
Rand, McNally Co., Chicago and New York.
Riker, H. E., Cleveland, Ohio.
Rivington's, London.
Robinson & Johnson, Belleville, Ont.
Routledge, George, & Sons, New York and London.
Sampson, Lowe, Marston & Co., London.
Sanborn, D. H., & Co., Boston.
Schoenhof, Carl, Boston.
Scott, Walter, London.
Scribner's, Chas., Sons, New York.
Seeley & Co., London, England.
Silver, Burdett & Co., New York and Boston.
Simpkin, Marshall, Hamilton, Kent & Co., London.
Smith, Elder & Co., London, Eng.
Soule, George, & Sons, New Orleans, Louisiana.
Soule Photo Co., Boston.
Stechert, G. E., New York.
Swan, Sonnenschein & Co., London.
University of Chicago Press, Chicago.
University Press, Cambridge.
University Tutorial Press—W. P. Clive—157 Drury Lane, London.
Unwin, T. Fisher, London.
Van Nostrand, D., New York.
Ward, Locke & Co., London.
Warne, Fred., & Co., New York.
Werner, Edgar S., Pub. and Supply Co., New York.
Western Penman Pub. Co., Cedar Rapids, Iowa.
Whittaker, Thos., New York.
Wiley, John, & Sons, New York.
Williams & Norgate, London and Oxford.
Wood, Wm., & Co., New York.
Wylie, John, & Sons, New York.
Zaner & Bloser, Columbus, Ohio.

BIBLIOGRAPHY OF HIGH-SCHOOL REFERENCE BOOKS.

Recommended by the Committee on High Schools of the University of Colorado.

I. ENGLISH.

Dictionaries, etc.

Standard Dictionary: 2 vols., $18.00 (one vol. ed. $15.00), new edition. 1901; Funk & Wagnalls. Encyclopædic in character, fuller explanations being given than are usual in a dictionary. Useful appendix similar to that of the International.

Students' Edition of the Standard Dictionary: 915 pages; Funk & Wagnalls. Abridged from the Standard. An excellent small dictionary.

The International Dictionary: Noah Webster. 2011 pages, $12.00; Merriam & Co. This is doubtless the best one-volume dictionary of the English language. The edition of 1902 is thoroughly revised. The appendices contain much valuable matter.

Worcester's Dictionary of the English Language: 2126 pages, $10.00; J. B. Lippincott Co. This dictionary is the standard authority in the Eastern portion of the United States. It contains useful appendices similar to those of the International.

New English Dictionary on Historical Principles: This dictionary is founded mainly on materials collected by the Philological Society since 1857, edited by J. A. H. Murray, LL.D. Very full on the philological side, including words in use for the past 700 years. It is an expensive work, chiefly valuable for the scholar. Vols. I-VI, A—L. Each vol. £2 12s 6d. Clarendon Press..

Etymological Dictionary of the English Language: W. W. Skeat. 844 pages, 1893, £2 4s; Clarendon Press. A very useful and concise volume. Murray's is of course the best authority so far as it has been completed.

Dictionary of English Literature: S. A. Allibone. 5 vols.; J. B. Lippincott Co.

Dictionary of American Authors: O. F. Adams. $3.50; Houghton, Mifflin & Co.

Dictionary of English Quotations: P. H. Dalbiac. With authors and subject index, 1896, $2.00; Macmillan Co.

Familiar Quotations: $2.50; J. B. Lippincott Co.

Prose and Poetical Quotations: S. A. Allibone. 2 vols., each $2.50; J. B. Lippincott Co. Both authors and subjects alphabetically indexed. This is the standard dictionary of quotations.

Cyclopædia of Practical Quotations: J. K. Hoyt. With appendix containing proverbs from modern foreign languages, Latin law terms, etc., $6.00 to $12.00, according to binding; Funk & Wagnalls.

Classical and Foreign Quotations: W. H. King. Law terms and maxims, proverbs, mottoes, phrases and expressions in French, German, Greek, Italian, Latin, Spanish and Portuguese, with translations, references, explanatory notes and indices, $1.75; Cassel Pub. Co.

Dictionary of English Synonyms and Synonymous Parallel Expressions: 488 pages, $2.25; J. B. Lippincott Co. This volume is designed as a help to the student of expression in the way of aptness and variety.

Synonyms Discriminated: Charles John Smith. 781 pages, $2.00; Henry Holt & Co. This work discriminates the use of words more closely than the other dictionaries of synonyms, and indicates the derivations.

English Synonyms: George Crabbe. New edition, 856 pages, $1.25; Harper & Bros. Quotations from the best authors illustrating the use of the words. A concise, convenient and useful work for student and teacher.

Thesaurus of English Words and Phrases: Peter Mark Roget. New edition. 429+271 pages; J. B. Lippincott Co. A collection of words and idioms arranged according to ideas which they express. The purpose of an ordinary dictionary is to explain the meaning of words. The object aimed at in this work is the converse of this—the idea being given, to find the most fitting expression.

Familiar Allusions: Charles G. Wheeler. A handbook of miscellaneous information, including the names of celebrated statues, paintings, palaces, country seats, ruins, churches, ships, streets, clubs, natural curiosities, etc., $2.00 to $3.50, according to binding; Houghton, Mifflin & Co.

Classic Myths in English Literature: Charles Mills Gayley. $1.50; Ginn & Co. This is a yery useful reference book for both teacher and student of English Literature.

Dictionary of National Biography: Edited by Sydney Lee. 55 vols., $5.00 each; Macmillan Co. This is the most complete and valuable cyclopædia of English biography, but is too extensive for most High Schools.

Chambers's Biographical Dictionary; The Great Men of All Times and Nations: Edited by David Patrick, LL. D., and Francis Hindes Groome. $3.50; J. B. Lippincott Co.

Appleton's Cyclopædia of American Biography: J. G. Wilson. 7 vols., $5.00 to $7.00 each; D. Appleton & Co.

Chambers's Cyclopedia of English Literature: 3 vols, each $5.00; J. B. Lippincott Co.

Chambers's Encyclopædia: Last edition, 1901, 10 vols., with illustrations, maps, etc., $20.00; J. B. Lippincott Co. This is a good, concise encyclopædia, with articles on American subjects by American specialists. Not much revision has been made since 1900.

New International Encyclopædia: 17 vols., $85.00; Dodd, Mead & Co.

Universal Cyclopædia: Edition 1900, prepared by a large corps of editors, assisted by eminent specialists, under the direction of C. K. Adams; 12 vols., with illustrations, maps, etc., $63.00; D. Appleton & Co. These two encyclopædias are well adapted to the use of high school pupils. They are of similar character and value. If an encyclopædia containing more exhaustive articles is desired, either the Encyclopædia Britannica with the American Supplement, or Appleton's, will be found the most satisfactory.

English Grammar and Philology.

English Language: H. R. Greene. $1.05; Houghton, Mifflin & Co.

Origins of the English People and Language: J. Roemer. $3.50; D. Appleton & Co.

Lectures on the English Language: G. P. Marsh. $3.50; Scribner's Sons A useful book for the teacher.

History of the English Language: Prof. T. R. Lounsbury. $1.12; Henry Holt & Co.

History of the English Language: Prof. O. F. Emerson. $1.00; Macmillan Co. This is an excellent work, embodying the more recent investigations in English philology. The native element in English is emphasized. Both of the two preceding works are very useful, probably the best yet published for the introductory study of the English language in High Schools.

The English Language, its Grammar, History, and Literature, with chapters on Composition, Versification, Paraphrasing and Punctuation; J. M. D. Meiklejohn, M. A. D. C. Heath & Co. An old but still valuable work.

Higher English Grammar: Alexander Bain. 80c; Henry Holt & Co.

Companion to the Higher English Grammar: Same author; Longmans, Green & Co. Old standard works, but valuable.

English Grammar: Prof. G. H. Bell in Bell's Language Series. 65c; Pacific Pub. Co., Oakland, Cal. A recent and concise treatise.

Whitney's English Grammar: 70c; Ginn & Co.

English Grammar: G. R. Carpenter. 75c; Macmillan Co.

English Grammar: W. M. Baskerville. 90c; American Book Co.

The Grammar of English Grammars: Gould Brown. A criticism of English grammar, valuable for the teacher of English; Wm. Ward & Co., New York.

A Short Historical English Grammar: Henry Sweet. 4s 6d; Clarendon Press.

Advanced Grammar and Composition: E. O. Lyte. American Book Co.

Primer of English Etymology: W. W. Skeat, 40c; Clarendon Press.

Primer of English Etymology: Henry Sweet. Revised edition. 50c; Clarendon Press.

Historical Outlines of English Accidence: Dr. Morris. Revised by Kellner and Bradley. $1.40; Macmillan Co.

Historical Outlines of English Syntax: L. Kellner. $1.40; Macmillan Co.

Shakespearian Grammar: E. A. Abbott, D.D. New edition, $1.50; Macmillan Co. The authority on the syntax and idiom of the English of Shakespeare and the Elizabethans generally; a book that should be familiar to every teacher of English.

Primer of Spoken English: Henry Sweet. 3s 6d; Clarendon Press.

Words and Their Ways in English Speech: Greenough and Kittredge. $1.25; Macmillan Co. A popular but scholarly exposition of the most important tendencies in the history and development of English words and meanings. A very interesting and suggestive volume.

Words and Their Uses Past and Present: Richard Grant White. $1.00; Houghton, Mifflin & Co.

Everyday English: A sequel to the preceding, same author, $2.00; Houghton, Mifflin & Co.

Parts of Speech: Brander Matthews. $1.25; Scribner's Sons. Americanisms, American spelling, the future of the language, slang, and many other interesting topics are treated.

Life and Growth of Language: W. D. Whitney. An outline of linguistic science, $1.50; D. Appleton & Co.

English Etymology: Kluge and Lutz. 60c; D. C. Heath & Co. The scope of this work is sufficient to give the student an introduction to the study of the historical development of the language, and an insight into the principal linguistic phenomena. The form of the book is that of a dictionary.

Principles of English Etymology: W. W. Skeat. First Series (vol. I.), $2.25—The Native Element; Second Series (vol. II.), $2.60—The Foreign Element; Clarendon Press.

Elementary Phonetics: A. W. Burt. 50c; Copp, Clark Co..

Structure of the English Sentence: L. G. Kimball. 75c; American Book Co.

Essentials of the English Sentence: E. J. MacEwan. 75c; D. C. Heath & Co.

Handbook of Poetics: F. B. Gummere. $1.10; Ginn & Co.

Primer of English Verse: H. O. Corson. $1.10; Ginn & Co.

These two handbooks are invaluable as giving in compendious and convenient form the leading facts of English versification, metre, rhythm, verse forms, kinds of poetry, etc. The former treats epic, lyric and dramatic forms, poetic style, figures, and metre; the latter, poetic unities, accent, melody, harmony, rhyme, poetic measures, and typical stanzaic forms, such as the Spenserian stanza, the sonnet types and blank verse.

Composition and Rhetoric.

English Composition: Barrett Wendell. $1.50; Scribner's Sons.

Paragraph Writing: Scott and Denney. $1.00; Allyn & Bacon.

Introduction to Theme Writing: Fletcher and Carpenter. 60c; Allyn & Bacon.

Working Principles of Rhetoric: Examined in their literary relations and illustrated with examples; John F. Genung. $1.40; Ginn & Co.

Foundations of Rhetoric: A. S. Hill. $1.00; American Book Co. A high school text book. Principles of Rhetoric by the same author and publisher is a more advanced work.

Talks on Writing English: Arlo Bates. Two vols., each $1.50; Houghton, Mifflin & Co.

English Teaching: G. R. Carpenter. Longmans, Green & Co.

English Composition; Notes for Teachers: G. R. Carpenter. 25c; Macmillan Co.

Elements of Rhetoric: Carpenter. Macmillan Co.

College Entrance Requirements in English, 1901-1905: 80c. American Book Co.

What is Good English? Harry Thurston Peck. $1.50; Dodd, Mead & Co.

Errors in the Use of English: W. B. Hodgson. 60c—$1.50; D. Appleton & Co.

Composition and Rhetoric: Lockwood and Emerson. Ginn & Co.

Elements of English Composition: Gardiner, Kittredge and Arnold. 1902; Ginn & Co.

English in Preparatory Schools: E. W. Huffcutt. 25c; D. C. Heath & Co.

Modern Punctuation. W. B. Dickson. 75c; G. P. Putnam's Sons.

English Punctuation. L. L. Williams. 60c; American Book Co.

Treatise on Punctuation. J. Wilson. $1.00; American Book Co.

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STEVENSON, ROBERT LOUIS—Complete Works: Thistle edition. 24 vols. $2.00 each. Scribner's Series. 6s each; Chatto & Windus. The following volumes published in 12mo. by Scribner's are more particularly suitable for a school library: Kidnapped, $1.50; David Balfour, $1.50; Treasure Island, $1.50; The Master of Ballantrae, $1.50; The Merry Men, $1.25; Virginibus Puerisque and other papers, $1.25; Across the Plains and other memories and essays, $1.25; Dr. Jekyll and Mr. Hyde, $1.00; St. Ives, $1.50.

Life: By Graham Balfour. 2 vols., 25s net, Methuen & Co.; $4.00 net, Charles Scribner's Sons.

IRVING—Complete Works: 12 vols. Popular edition, $12.00, library edition, $12.50, half leather, $15.00; T. Y. Crowell & Co.

EMERSON—English Traits and Representative Men: Eversley series. 5s; Macmillan Co.

HAWTHORNE—Works: Riverside edition. 13 vols., $2.00 each. Popular edition. 8 vols., $10.00; Houghton, Mifflin & Co. 13 vols., 7s 6d each; Kegan Paul, Trench, Truebner & Co.

WHITTIER—Complete Poetical and Prose Works: Riverside edition. 7 vols., $10.50. Complete Poetical Works. Cambridge edition. $2.00. Household edition. $1.50. Cabinet edition. $1.00; Houghton, Mifflin & Co.

Complete Poetical Works: 4s 6d; Macmillan Co.

LOWELL—Works: Riverside edition. 12 vols., $1.50 each.

Complete Poetical Works: Cambridge edition, $2.00, Household edition, $1.50, Cabinet edition, $1.00; Houghton, Mifflin & Co.

Complete Works: 10 vols., 6d each; Macmillan Co.

LONGFELLOW—Complete Poetical and Prose Works: Riverside edition. 11 vols., $16.50; Houghton, Mifflin & Co.

Complete Poetical Works: Riverside edition. 2 vols., $3.00, Cambridge edition, $2.00, Household edition, $1.50, Cabinet edition, $1.00; Houghton, Mifflin & Co.

HOLMES—Complete Poetical and Prose Works: Riverside edition. 14 vols., $1.50 each, Popular edition, 8 vols., $10.00; Houghton, Mifflin & Co.

Poems: Riverside edition. 3 vols., $4.50, Cambridge edition, $2.00, Cabinet edition, $1.00; Houghton, Mifflin & Co. Note—Houghton, Mifflin & Co. publish a large number of editions of Longfellow, Hawthorne, Holmes, Whittier, Lowell.

Cheap Editions of Authors.

For literature in the lower grades and for supplementary literature in the higher grades, many cheap series are available. The following are the names of publishers with the titles of series which include many excellent works. Sample copies may usually be obtained.

Alden, John B., 442 Pearl St., New York. This publisher issues a large number of very cheap standard works.

American Book Co. Eclectic English Classics. Bound, 20c to 50c.

Black, A. & C., London and Edinburgh. Editions of Scott's Works, 20c each.

Cassel Publishing Co., New York. National Library (410 vols.) Paper, 10c; cloth, 25c. A very excellent series.

Crowell, T. Y., & Co., 426 and 528 West Broadway, New York. Handy Volume Classics. Paper, 40c; cloth, 50c.

Doubleday & McClure, New York. Little Masterpiece Series, 35c.

Donoghue Bros., Chicago. Words and Poems, 15c; Ætna series (300 vols.), 35c.

Educational Publishing Co., Boston. Ten-cent classics. Paper, 10c; cloth, 25c. A very excellent series, especially the 10c Shakespeare.

English Classics. Edited by G. R. Carpenter, 28 vols.; Longmans, Green & Co.

Eclectic Series of English Classics. 45 numbers. American Book Co.

Flanagan, A., Co., Chicago. Little Classic series. Paper, 5c and 10c. Legend of Sleepy Hollow, Evangeline, Deserted Village, Elegy, Enoch Arden, etc.

Ginn & Co., Boston. Classics for Children. From 25c to 90c. Standard English Classics, 20c—60c.

Gage, W. J., & Co. Both this firm and The Copp, Clark Co. usually have in stock annotated editions of English Classics, which, being no longer prescribed for the examinations, they are willing to sell at a reduced rate.

Hurst & Co., New York. Gilt Top series, 30c; Emerson series, 25c; Cambridge Classics, 35c; New Argyle series, 30c; Plain Poets, 40c; Arlington Wonder library, 20c, and others equally cheap.

Houghton, Mifflin & Co., Boston. Modern Classic series, 40c; Riverside Literature series (136 vols.), 15c to 40c; Riverside Aldine Classics, 50c; Riverside paper series of words and stories (68 vols.), 50c.

D. C. Heath & Co., New York. English Classics, 20c to 50c.

Harper & Bros., New York. Half-hour series, 25c.

Longmans, Green & Co., New York and London. English Classics series. Board, 40c; cloth, 50c.

Macmillan Co., London and New York. Pocket series of American and English Classics, 25c; Temple Classics and Temple Classics for Young People, 50c; Bell's English Classics, 40c.

Mershon & Co., New York. Mershon's Classics, 30c.

Maynard, Merrill & Co., New York. English Classic series (220 vols.), 12c to 24c.

New York Publishing Co. Empire editions, 30c.

Routledge & Son, London and New York. Dainty library, 40c; Universal library, 40c.

Scott, Walter, London. Favorite prose works, 35c; The Canterbury Poets, 35c.

Silver, Burdett & Co., New York. Silver series of English and American Classics, 25c to 30c.

Star Series of English Classics, 15 vols., each, 32c to 50c; Globe Pub. Co.

Whittaker, Thomas, New York. The Standard series (150 vols.), cloth, 15c; Winona series (179 vols.), cloth, 20c; Laurel edition, cloth, 30c; The Henty series, 25c; The Ruby series for boys (40 vols.), cloth, 25c; Young People's Library, cloth, 25c.

Other Editions.

Besides the cheaper editions, the following have also been found satisfactory for supplementary literature in the higher grades and for literature in the lower grades. Copies of the more expensive works may be provided by the high school board for class use, or may be used by the teacher for reading to the pupils in the class.

Avon Edition of the Poets, 75c each; Hurst & Co.

Antique Library, Atlantic Library, Nineteenth Century 12mos., $1.00 each; New Alpha Library of 12mos., 75c; Rand, McNally Co.

American Anthology: By E. C. Stedman. $3.00; Houghton, Mifflin & Co.

British Anthologies: Edited by Prof. E. Arber. 10 vols., 2s 6d each; Clarendon Press.

Cambridge Classics (33 vols.), Handy Volume Classics (4 vols.), Notable Series (8 vols.), Riverside Aldine Series (14 vols.), Riverside Classics (10 vols,), $1.00 each; Riverside School Library (50 vols.), 60c to 70c; John Burroughs' Works; each volume 16mo, gilt top, $1.25; the set, 10 vols., uniform, $12.50, half calf, $25.00; Houghton, Mifflin & Co.

Famous Novel Series, $1.25 each; Macmillan Co.

Fifty Years of English Song; or, Selections from the Poets of the Reign of Victoria: Edited and arranged by H. F. Randolph. 4 vols., $6.00; Anson D. F. Randolph & Co.

Golden Treasury Series: By various authors; Macmillan Co. An excellent series, containing a very large number of volumes.

Household Edition of Standard Classics (106 vols.), 75c; Henry T. Coates & Co.

Landsdowne Poets: $1.25 each; Frederick Warne & Co.

Library of English Classics: 8vo. Price, $1.50 net per volume; Macmillan Co. The following is a list of the volumes already issued: Sheridan's Plays, one vol.; Bacon's Essays, etc., one vol.; Malory's Morte D'Arthur, two vols.; Sterne's Tristram Shandy and Sentimental Journey, two vols.; Boswell's Life of Johnson, three vols.; Carlyle's French Revolution, two vols.; Fielding's Tom Jones, two vols.; Travels of Sir John Mandeville; with Illustrative Narratives from Hakluyt, one vol.; White's Natural History of Selbourne, one vol.; Lockhart's Life of Scott, five vols.; Don Quixote, translated by Shelton, three vols.; De Quincey's Confessions of an Opium Eater, Murder as a Fine Art, English Mail Coach, etc., one vol.; Walton's Lives, and Complete Angler, one vol.; Carlyle's Sartor Resartus and Heroes and Hero Worship, one vol.

Literary Selections for Advanced Classes. 45c; The W. J. Gage Co. A well selected volume of both poetry and prose.

Little Library, containing a biography and critical estimate of each work, with occasional short footnotes. Cloth, 1s 6d a vol. net; Methuen & Co.

New Alpine Series: 75c; Donoghue & Co.

New Astor Library of Prose: Cloth, 60c.

New Alta Library (256 vols.), 75c each; Henry T. Coates & Co.

Standard English Poems: Spenser to Tennyson. Selected and edited by Pancoast. 749 pp., $1.50; Henry Holt & Co.

Treasury of Irish Poetry: By Stopford Brooke. $1.75; Macmillan Co.

Victorian Anthology: By the same author annd publishers.

Waldorf Library, 75c; Abbotsford Edition of Poets (52 vols.), 75c; Gladstone Edition of Poets, 75c; T. Y. Crowell & Co. The poets are: Dunbar, Surrey and Wyatt, Spenser, Shakespeare, Johnson, Milton, Dryden, Pope, Goldsmith, Cowper.

II. HISTORY.

It is difficult to recommend a bibliography in history suitable for a high-school library because of the vastness of the subject, and the necessarily different methods of approaching history in different schools under the direction of different teachers. The following suggestions must, therefore, not be regarded as anything more than suggestions. The University will be glad at any time to advise with teachers and principals regarding particular books or problems peculiar to individual needs, and to suggest from the following lists the books most suitable in each instance:

Bibliographies and General Reference Works.

A Manual of Historical Literature. C. K. Adams. About $3.00; Harper & Bros. An old, but still the only, work in English attempting to cover the entire field of history with critical estimates of works cited. Is exceedingly useful, and exceptionally trustworthy.

Institutes of General History. E. Benjamin Andrews. About $2.00; Silver, Burdette & Co. Each chapter is preceded by a select bibliography of English, French, German and Italian works. The whole arrangement of the book itself, and the author's brief comments and notes are exceedingly suggestive, although the reader must not infrequently disagree with the writer in his necessarily brief statements.

Guide to the Study of American History. Channing and Hart. About $1.50; Ginn & Co. Contains a great deal of information and many helpful suggestions as to study and class work. It names "working libraries" varying in price from five to one hundred dollars, and lists also most of the books available on the period of exploration and colonization, the colonial period proper and the various periods of United States History under the Constitution.

A Student's History of England. Gardiner. $2.75; Longmans, Green & Co. A narrative history of England from earliest times to 1874, with a summary of events from 1874 to 1885. Has many genealogical tables, numerous authentic illustrations from documents, paintings, etc., of the reign of nearly every English sovereign, and, at the close of each part, has a list of books recommended for the further study of that part.

A School Atlas of English History. Gardiner. $1.50; Longmans, Green & Co. Several copies are desirable, depending upon the size of classes. The numerous maps, plans and diagrams are almost as helpful in studying general European History, as in studying the History of England.

The Literature of American History. Larned (editor of). $6.00; published for the American Library Association by Houghton, Mifflin & Co. A list of sources and books for all periods of American History and all sections of the North American Continent. The brief review and estimate of each book is signed by the historian who makes it. The work includes all sources and books on American History down to the year 1899. It is indispensable to the student of American History.

History for Ready Reference and Topical Reading. Larned. 6 vols. Costs about $30.00; C. A. Nichols Co., Springfield, Mass. The publishers

should be written to direct for quotation of price. The sixth volume deals with recent history, including the Spanish-American War, the South African War, the Hague Court, etc., etc. The work is monumental in its conception and is excellently carried out. In brief, the plan is to arrange in alphabetical order the countries and great topics of history, with a most elaborate and painstaking system of cross references. The countries and topics thus arranged are then treated by excerpts in chronological order from the great writers of history. Practically every standard history published prior to this work is quoted from at length in one or more passages, reference being always given in full to the original volume from which the selection is made. Charters, documents, charts, and a fine series of maps, are scattered through these volumes, so that, all things considered, the work is probably the best single reference work in history that has yet been published. It ought to be especially useful in high-school libraries, and, in case the whole field of history is to be covered at relatively small expense in beginning the accumulation of a history library, the advisability of purchasing this work first of all is suggested.

Ancient History to the Death of Charlemagne. Willis Mason West. $1.50; Allyn & Bacon. Contains in the appendix a "classified bibliography" covering Primitive Society, Oriental History, Greek History, Roman History, and the Teutonic Period to 800 A. D. No estimate is made of the various books recommended, but the list is discriminating and well arranged.

Epitome of Universal History. Ploetz. About $2.00; Houghton, Mifflin & Co. The English translation here referred to is by Tillinghast, and is far superior to the original in that there are extensive additions by the translator. The chief value of the work is as a book of dates and summaries, the more important dates being indicated by heavy type.

A Guide Book to Books. Sargent and Whishaw. Henry Frowde, London. This book is a little out of date (published in 1891), but is still of great value, as it contains very brief estimates of the more important works cited. It covers everything from shorthand to trigonometry, including field sports, psychology, technical processes, etc., etc. Its historical references are very good. It claims to have been compiled throughout by specialists in every field mentioned. Cost is about $3.00.

A Guide to Systematic Readings in the Encyclopædia Britannica. James Baldwin. About $1.50; Werner Co. Covers many of the topics in the Britannica, and brings together many things usually overlooked. High-school libraries already possessing the Britannica would probably be able to increase the usefulness and usableness of it by means of this unpretentious volume. Three courses of reading in history are suggested and outlined.

Subject Index to Universal Prose Fiction. Zella Allen Dixson. Helpful in recommending to pupils reading in fiction based upon, or explanatory of, periods or events in history.

Historical Sources in Schools. Report to the New England History Teachers' Association by a select committee. (Profs. Hazen, Browne, Dean, Farrand, Hart). New York. 75c. 1902; Macmillan Co.

Greek History.

TRANSLATIONS OF SOURCES.

Aristotle, Politics: Translated by Weldon. $2.50; Macmillan Co.

Demosthenes on the Crown: Translated by Kennedy. $1.00; Macmillan Co.

Herodotus: Translated by Macaulay. $4.50; Macmillan Co.

Homer's Iliad: Translated by Lang, Leef and Myers. $1.50; Macmillan Co.

Homer's Odyssey: Translated by Butcher and Lang. $1.50; Macmillan Co.

Thucydides: Translated by Jowett. $3.00; Lothrop.

Xenophon's Anabasis: Translated by Dakyns. $2.50 per vol., approximately. 3 vols.; Macmillan Co.

SECONDARY SOURCES OF A GENERAL NATURE.

Atlas Antiquus: Kiepert. Leach, Shewell, Sanborn. $2.00. Several copies desirable, the number depending upon the size of classes.

History of Greece: Curtius. 5 vols., $10.00; Charles Scribner's Sons.

Western Civilization in Its Economic Aspects: Cunningham. 2 vols., about $1.50 each; Macmillan Co.

Home Life of the Ancient Greeks: Blümner. $2.00; Cassell & Co.

Development of the Athenian Constitution. Botsford. $1.50; Macmillan Co.

Ancient History for Beginners: Botsford. 1902; Macmillan Co.

History of Greece: Bury. $1.50; Macmillan Co.

The City-State of the Greeks and Romans: Fowler. $1.00; Macmillan Co.

History of Greece: Grote. 12 vols., $18.00; Harper & Bros.

A History of Architecture: Hamlin. About $1.50; Longmans, Green & Co.

History of Greece: Holm. 4 vols., $10.00; Macmillan Co.

Short History of Greek Philosophy: Marshall. $1.10; Macmillan Co.

A History of Sculpture: Marquand and Frothingham. About $1.50; Longmans, Green & Co.

History of Greece: Timayenis. 2 vols., $3.50; D. Appleton & Co.

SECONDARY SOURCES ON MORE SPECIFIC TOPICS OR PERIODS.

Age of Fable. Bulfinch. $3.00; Lee & Shepard.

Education of the Greek People. Davidson. $1.50; D. Appleton & Co.

History of Federal Government in Greece and Italy: Freeman. $1.00; Macmillan Co.

Handbook of Greek Constitutional History: Greenidge. $1.25; Macmillan Co.

Classic Myths: Gayley. $1.65; Ginn & Co.

Handbook of Greek Sculpture: Gardner. $2.50; Macmillan Co.

History of Classical Greek Literature: Mahaffy. 2 vols., $4.50; Macmillan Co.

Greek Life and Thought from the Age of Alexander to the Roman Conquest: Mahaffy. $3.50; Macmillan Co.

Alexander the Great: Wheeler. $1.50; G. P. Putnam's Sons.

Greece in the Time of Homer: Timayenis.

Roman History.

TRANSLATIONS OF SOURCES.

Livy: Translated by Spillan. 4 vols., $4.00; Macmillan Co.

Tacitus: 2 vols., $3.50; Macmillan Co.

University of Pennsylvania: Translations and reprints, 7 vols. now out, at about $1.50 each; University of Pennsylvania. These reprints run into the life and history of the Mediæval Period in Europe.

SECONDARY SOURCES OF A GENERAL NATURE.

Roman Political Institutions. Abbott. Ginn & Co.

Civilization During the Middle Ages: George Burton Adams. $2.50; Chas. Scribner's Sons.

The Later Roman Empire: Bury. 2 vols., $6.00; Macmillan Co.

Decline and Fall of the Roman Empire: Gibbon. An edited edition should be purchased, as later research has corrected Gibbon in many points. Dean Milman edits with copious notes, including the opinions of previous commentators, an edition published by Charles Scribner's Sons at $3.00, 6 vols. A better and later edition has been prepared by Bury, in 7 vols, $14.00.

History of Rome: Ihne. 5 vols., $18.75; Longmans, Green & Co.

History of Rome: Mommsen. 5 vols., $10.00.

Outlines of Roman History: Pelham. $1.75; G. P. Putnam's Sons.

Private Life of the Romans: Preston and Dodge. $1.25; Leach.

SECONDARY SOURCES ON MORE SPECIFIC TOPICS OR PERIODS.

The Roman Empire to 180 A. D.: Bury. $1.50; Macmillan Co.

Early Roman Empire: Capes. $1.00; Charles Scribner's Sons.

Age of the Antonines: Capes. $1.00; Charles Scribner's Sons.

Roman Society in the Fifth Century: Dill. $2.50; Macmillan Co.

Hannibal: Dodge. $5.00; Houghton, Mifflin & Co.

Cæsar: Dodge. $5.00; Houghton, Mifflin & Co.

Cæsar, a Sketch: Froude. $1.50; Longmans, Green & Co.

Chief Periods of European History: Freeman. $3.00; Macmillan Co.

Ruins and Excavations of Ancient Rome: Lanciani. $6.00; Houghton, Mifflin & Co.

Triumvirates: Merivale. $1.00; Charles Scribner's Sons.

The Church and the Empire, to 170 A. D.: Ramsay. $3.00; G. P. Putnam's Sons.

Lectures and Essays: Goldwin Smith. $2.00; Macmillan Co.

Rome and Carthage: R. B. Smith. $1.00; Charles Scribner's Sons.

Outlines of Church History: Sohm. $1.10. Translated by Sinclair; Macmillan Co.

Continental European History.

From the foregoing list on Roman History, Adams, Bury, Freeman, Gibbon, Sohm, and the University of Pennsylvania reprints, and, in addition, at least the following works:

European History: George Burton Adams. $1.50; Macmillan Co. Contains excellent bibliographies, and presents a masterly summary and outline of the general course of European history, with numerous side references to larger works.

Mediæval and Modern History, an Outline of Its Development: Adams. 1902. Macmillan Co.

Life of Charlemagne: Einhard. 35c; Harper & Bros. A charming and naive life of Charles the Great, by his friend and private secretary. Presents the personal side of the man admirably in very small compass.

Mediæval Europe, 395-1270: Bémont and Monod. Translated by George Burton Adams. About $1.50; Henry Holt & Co. One of the best general histories of this period.

Holy Roman Empire: Bryce. Numerous editions. Can be secured in good clear print for 75c. The classic treatment of this topic.

Western Civilization in Its Economic Aspects: Cunningham. Vol. II, Mediæval and Modern Times (see under Greek History.)

The Intellectual Development of Europe: Draper. 2 vols. About $2.25; Harper & Bros.

Introduction to the Study of the Middle Ages: Emerton. About $1.00; Ginn & Co. A charmingly written book for a fifteen-year-old boy.

Mediæval Europe: Emerton. About $2.00; Ginn & Co. A continuation of the Introduction to the Middle Ages, but far less readable for young pupils.

Select Documents of the Middle Ages: Henderson. About $1.50; George Bell in Bohn's library. Contains especially documents relating to the struggle between the Papacy and the Empire.

The Roman and the Teuton: Kingsley. About $1.50; Macmillan Co. This is a series of lectures written with all Kingsley's charm of style, and delivered before the University of Cambridge. Very readable and highly suggestive.

General View of the Political History of Europe: Lavisse. Translated by Gross. About $1.00; Longmans, Green & Co. A sweeping, summary view of the course of European History, condensed within 172 pages. Suggestive and readable. Presupposes a good knowledge of European History in general. Ought to prove specially helpful to teachers in keeping the large aspects of European History before their pupils.

History of the Middle Ages: Munro. D. Appleton & Co, 1902. A short but excellent work.

Periods of European History: 8 vols. About $1.50 per volume, or about $10.00 all together; Macmillan Co. Period I, The Dark Ages, 476-918. Oman. Period II, The Empire and the Papacy, 918-1273. Tout. Period

III, The Close of the Middle Ages, 1273-1494. Lodge. Period IV, Europe in the Sixteenth Century, 1494-1598. Johnson. Period V, The Ascendancy of France, 1598-1715. Wakeman. Period VI, The Balance of Power, 1715-1789. Hassal. Period VII, Revolutionary Europe, 1789-1815. Stephens. Period VIII, Modern Europe, 1815-1899. Phillips. This "Periods" series is, on the whole, rather dull and uninspiring reading. but is accurate and detailed as to scholarship, and presents in English a wealth of material not easily accessible in any other place. It is probably the best set of books covering mediæval and modern Europe as yet published.

History of Western Europe: Robinson. Ginn & Co., 1903. One of the latest and best books on this subject. It is thoroughly up to date and suitable either as a text-book or as a reference book.

English History.

From the foregoing list on Continental European History, Adams' Civilization during the Middle Ages, Bryce, Cunningham, Bémont and Monod, Lavisse, and the following books at least:

Select Documents of English Constitutional History: Adams and Stephens. $2.25; Macmillan Co. Documents arranged chronologically, under the reigns of successive sovereigns, beginning with William the Conqueror, and ending with Victoria in 1885. All documents are translated into English. An invaluable collection.

The English Constitution. Bagehot. About $2.00; D. Appleton & Co. Contains also two essays, one on "The Character of Lord Brougham," the other on "The Character of Sir Robert Peel." This book is one of the most brilliant and illuminating expositions of the real significance of the English Constitution. It was written some thirty years ago, and many of the topics then discussed tentatively have since been worked out actually by the course of events. Particularly interesting in its discussion of democracy.

The Working Constitution of the United Kingdom. Courtney. About $2.00; Macmillan Co. Describes the actual working of the Constitution as it now exists. All the more important practical questions regarding the relations of the mother country and her colonies receive adequate treatment.

The Industrial History of England. H. de B. Gibbin,. Methuen & Co., London. A short history of the industrial development of England. Contains a brief annotated bibliography at the end.

A Student's History of England. Gardiner. [See first heading, "Bibliographies and General Reference Works."]

School Atlas of English History. Gardiner. [See above under "Bibliographies and General Reference Works."]

History of the English People. Green. Several editions by various publishers. Price varies from $2.00 to about $15.00, and the number of vol-

umes from 4 to 6. The best general history of England that has yet appeared. Valuable as history and as literature.

Liberty Documents, with Contemporary Exposition and Critical Comments Drawn from Various Writers: Mabel Hill. About $2.00; Longmans, Green & Co. The author calls this "A Working Book in Constitutional History." It begins with 1101 and runs down through English and American History to a discussion of "Liberty in United States Colonies and Dependencies (1898-1899)." A highly suggestive and valuable collection of documents and expositions thereof.

Source-Book of English History. Elizabeth K. Kendall. About $2.00; Macmillan Co. The author has here "sought to bring together extracts illustrating the dominant interest of each period," and to present such extracts as are "of real value for purposes of study, and yet of a nature to arouse the interest of the boy or girl of sixteen." The attempt is eminently successful. Each extract is accompanied by running comments in the margin. The collection is not a lot of constitutional documents, but rather a series of contemporary comments on English affairs, such as "A Letter from Canute to the English People, 1027;" "A Picture of London, circa 1173;" "The Scots in War;" "The Battle of Towton, 1461;" "Two Sixteenth Century School Boys;" "A Famous Scene in the House of Commons, 1629;" etc., etc.

A History of England for High Schools. Koman and Kendall; Macmillan Co., 1901. Gives also a valuable list of aids to the study of English History.

The English Constitution, a Commentary on Its Nature and Growth: Macy. $2.00; Macmillan Co. A highly suggestive account of the English Constitution written by an American teacher of wide experience, with the idea of making the significance of the English Constitution intelligible to American readers. Professor Macy states in his preface that "Part I was prepared specially in order that Americans might be able to read with greater profit Bryce's The American Commonwealth. To appreciate that great work, the American needs to be well grounded in English politics. He must know the present Constitution in its theory and in its practice." Part II, on "The Growth of the Constitution," keeps in view, also, the understanding of the Constitution as it exists to-day. The views of practically all standard commentators such as Anson, Bagehot, Dicey, etc., are presented in this work passim.

Diary of a Journey to England in the Years 1761-1762. Kielmansegge. About $1.50; Longmans, Green & Co. The translator of this interesting volume, the Countess Kielmansegge, says, "One day, on looking through the library at my German home, I came upon a manuscript written by my husband's great-grandfather, containing a diary of his journey to England in the years 1761-1762, in which he describes—for the benefit of his German family and friends—the coronation of George III., which he witnessed—London and its sights, the society of that day, and his visits to various towns and country places in England."

A History of Our Own Times. Justin McCarthy. A well-known work, published in many editions, by a number of publishers. Easily obtainable in cheap or expensive form.

Merchant Adventurers of England, Their Laws and Ordinances, with Other Documents: Compiled and translated by W. E. Lingelbach, Ph. D.; University of Pennsylvania. Reprints handled by Longmans, Green & Co. This work is Second Series, Volume II of the Reprints. The title as quoted exactly describes the book. It is one of the more important recent contributions to the documentary history of the rise of industrial and commercial England.

The Elements of English Constitutional History. Montague. About $1.25; Longmans, Green & Co. An excellent little manual in 228 pages.

English History: Montgomery. Ginn & Co.

The Expansion of England. Seeley. About $1.25; Macmillan Co. An old book (published 1883), but still useful and suggestive, as it presents a broad and sweeping view from the standpoint of the philosophical statesman and historian.

Social England, by Various Writers: Edited by H. D. Traill. 5 vols.; G. P. Putnam's Sons. Write publishers for price. This great, co-operative work professes to give "A Record of the Progress of the People in Religion, Laws, Learning, Arts, Industry, Commerce, Science, Literature, and Manners from the Earliest Times to the Present Day." It is sufficient to say that this tremendous undertaking has been adequately fulfilled.

Landmarks of English Industrial History. Townsend Warner. $1.50; Macmillan Co. Title exactly describes this excellent little work.

American History.

The following suggestions pertain more especially to United States History. From the foregoing lists, it would be desirable to have the following as affording a European point of view—Adams and Stephens, Hill, Kendall, Lavisse, Seeley.

American Statesmen: Edited by John T. Morse, Jr. The new library edition has an index volume, and a number of revisions in the text of each volume. If possible, the entire set should be secured. Especially desirable are the volumes on Thomas Jefferson, Alexander Hamilton, Daniel Webster, Andrew Jackson, Henry Clay, John Quincy Adams, John C. Calhoun. The biographies of Washington and Lincoln ought to be added, either in this series or in some other standard works. The publishers should be written to for prices.

American History Series: Charles Scribner's Sons. From $1.25 to $1.75 per volume: The Colonial Era, 1492-1756. Fisher. The French War and the Revolution, 1756-1783. Sloane. The Making of the Nation, 1783-1817. Walker. The Middle Period, 1817-1858. Burgess. The Civil War and the Constitution, 1858-1865. Burgess. Reconstruction and the Constitution, 1866-1876. This series is uneven in merit, the most suggestive

work in it being, possibly, Burgess' Middle Period. Burgess' later volumes on the Civil War and Reconstruction should be used in connection with Dunning (see below), or with Garner (see below).

The History of the Last Quarter Century in the United States. E. Benjamin Andrews. 2 vols., about $6.00; Charles Scribner's Sons. Generously printed and superbly illustrated. Presents the chief events, and foreshadows most of our industrial problems of to-day. Ought to be specially interesting to high school pupils.

History of the United States: Bancroft. About $10.00; D. Appleton & Co. Last edition in 8 vols., "the Author's Last Revision." Strongly prejudiced in favor of the American point of view, but interesting and profitable for this very reason, as the work is bound to provoke discussion among the pupils who read it. It should be used in connection with other works, and especially with Lecky (see below).

The American Commonwealth: Bryce. 2 vols., unabridged edition. A special price of $2.00 sometimes available; Macmillan Co.. The standard work from an English standpoint. Invaluable for an understanding of our political institutions.

Guide to the Study of American History. Channing and Hart. (See above, under bibliographies and general reference works.)

The Federalist: Many editions. Probably the best yet issued is that by Paul Leicester Ford. $1.75; Henry Holt & Co. The wealth of citations to cases, the cross references, and the ample index make this edition exceedingly valuable.

Works on American History: John Fiske. Houghton, Mifflin & Co. Write publishers for prices. Fiske's fine English, his philosophical breadth of view, the general accuracy of his conclusions, his dramatic power combine to make these works of rare interest and suggestiveness to high school pupils.

Epoch Maps: Albert Bushnell Hart. About 50c; Longmans, Green & Co.

American History Told by Contemporaries: Albert Bushnell Hart. 4 vols., $2.00 per vol, or $7.00 for the set; Macmillan Co. The volumes are each preceded by a discussion of "sources" of history, their use, etc. This collection differs from MacDonald's collection (see below), in that it consists of excerpts from writers contemporary with the times they describe. It contains such selections as "The Piety of a Sea Rover;" "How to Order a Colony;" "Life of a Southern Planter;" "The Capitulation of Yorktown, 1781;" "Burr's Muster at Blennerhasset Island;" "Capture of the Chesapeake by the Leopard, 1807;" "Why John Brown Broke the Laws;" "Experience of a Blockade-Runner, 1862," etc., etc.

Outline Maps for an Historical Atlas of the United States, Illustrating Territorial Growth and Development: Frank H. Hodder. For class use; Ginn & Co. Write publishers for prices. The only set of outline maps which at all meets the promise of the title page. Prof. Hodder has spent years in elaborating these outlines, and has succeeded in correcting

numerous errors as to boundary lines and details. A full set of directions is printed with the maps.

History of the American Nation: McLaughlin; D. Appleton & Co., 1899.

Larned (see above, under bibliographies and general reference works).

The American Revolution, 1763-1783, being the chapters and passages relating to America from the author's history of England in the eighteenth century: Lecky. Edited by James A. Woodburn. About $1.25; D. Appleton & Co. An invaluable commentary on the American Revolution. Should be used in connection with Bancroft (see above).

Select Charters and Other Documents Illustrative of American History, 1606-1775; Also Select Documents Illustrative of the History of the United States, 1776-1861: William McDonald. About $2.00 per volume; Macmillan Co. Titles exactly describe these two valuable works.

Works of Francis Parkman: Several editions; Little, Brown & Co. Write publishers for prices. 16 vols. These volumes possess all the charm of romance, with all the merit of great accuracy and historical research of the most persistent and painstaking sort. Parkman's English, too, is classic, vigorous, delightful, and carries one irresistibly from cover to cover of a volume once it is taken up. Both as history and as English, these books are probably destined to endure for many years.

The Winning of the West: Theodore Roosevelt. 4 vols. About $10.00; D. P. Putnam's Sons. The only comprehensive treatment of Western United States History.

Expansion of England: Seeley. (See above.)

The Men Who Made the Nation: Edwin Earl Sparks. About $2.00; Macmillan Co. Excellent biographies of Franklin, Samuel Adams, John Adams, Robert Morris, Hamilton, Washington, Jefferson, Clay, Andrew Jackson, Webster, Horace Greeley, Lincoln. Each statesman is treated as the exponent of some leading idea in American History, or as the representative of a typical set of functions performed by him.

A History of the Presidency: Edward Stanwood. About $2.00; Houghton, Mifflin & Co. Originally published in 1884 as a "History of Presidential Elections." Republished with many additions in 1898 under the present title, bringing it down to the Free Silver Campaign of 1896. The book gives an account of each Presidential election from Washington down, with the platforms of parties, analysis of the votes, and much interesting and useful material. It is the standard work on this topic.

A History of American Literature During the Colonial Times: Moses Coit Tyler. Vol. I, 1607-1676; Vol. II, 1676-1765. Brief biographies of famous writers, and of writers not so famous but deserving of attention because so representative of their times, together with long excerpts from their writings. Captain John Smith, William Bradford, Thomas Hooker, Roger Williams, Anne Bradstreet, Cadwallader Colden, Cotton Mather, Benjamin Franklin, John Adams, Roger Wolcott and a host of other writers receive adequate and fascinating treatment. Prof. Tyler's English is clear, illuminating, remarkably happy and suggestive, and

cannot fail to interest the average school boy; G. P. Putnam's Sons. $2.50 per volume.

The Literary History of the American Revolution: Moses Coit Tyler. Vol. I, 1763-1776; Vol. II, 1776-1783. Similar in scope and treatment to the foregoing. G. P. Putnam's Sons publish this and the preceding set at $2.50 per volume.

The Industrial Evolution of the United States: Carroll D. Wright. About $1.00; Flood & Vincent, the Chautauqua Press. This unpretentious volume treats most concisely and suggestively the topic named in its title. Mr. Wright, who has long been United States Commissioner of Labor, is the foremost authority in our country in this line.

Civil Government in the United States.

From the foregoing lists Bryce, the Federalist, Stanwood.

Manual of the Constitution of the United States: Israel Ward Andrews. About $1.25; American Book Co.

The Constitution of the United States at the End of the First Century: Boutwell. About $1.50; D. C. Heath & Co.

Civil Government in the United States: John Fiske. About $1.00; Houghton, Mifflin & Co.

The Speaker of the House of Representatives: M. P. Follett. About $1.50; Longmans, Green & Co.

Civil Government of Colorado: Dorus R. Hatch. About $1.00; Centennial School Supply Co., Denver, Colo.

The American Government, National and State: B. A. Hinsdale. About $1.50; Werner School Book Co.

Government in State and Nation: James and Sanford. About $1.25; Charles Scribner's Sons. Gives bibliography at end of work.

History of American Politics: Alexander Johnston. About $1.00; Henry Holt & Co.

Congressional Committees: Lauros G. McConachie. $1.75; T. Y. Crowell & Co.

The Government of the American People: Strong and Shafer. About $1.25; Houghton, Mifflin & Co.

The State, Elements of Historical and Practical Politics: Woodrow Wilson. About $2.50; D. C. Heath & Co.

III. POLITICAL ECONOMY.

Dictionary of Political Economy: R. H. Palgrave. 3 vols.; Macmillan Co. The best reference work on the subject. Thoroughly comprehensive, scientifically accurate and complete.

Cyclopedia of Political Science: J. J. Lalor. 3 vols.; Cary & Co., Chicago. While this work does not cover an especially wide range of subjects, the articles are exhaustive and able. Special attention is paid to United States History and Politics.

Encyclopedia of Social Reform: W. D. P. Bliss. Funk & Wagnalls Co. This work covers nearly the whole field of the social sciences, and is thoroughly up to date. The articles are concise and usable.

History of Bimetallism in the United States: J. L. Laughlin. D. Appleton & Co. A history of the coinage of the country. It is an able and clear representation of the facts, though it does not include the history of the last ten years.

Municipal Government in Great Britain: Albert Shaw. Century Co. A most interesting account of the governments of the leading cities of England and Scotland, written from personal study and inspection.

Municipal Government in Continental Europe: Albert Shaw. Century Co. Similar to the above, only treating of the governments of Paris and of the cities of Germany.

American Charities: Amos G. Warner. T. Y. Crowell & Co. Covers the entire subject, and is especially valuable from a practical point of view. It is a careful study of the causes and treatment of poverty and pauperism.

Punishment and Reformation: F. H. Wines. T. Y. Crowell & Co. A scientific study of the best methods of dealing with crime by one of the leading specialists in the United States.

The American Commonwealth: James Bryce. Macmillan Co. The most valuable of all works on American institutions.

IV. MATHEMATICS.

History and Philosophy of Mathematics.

Cajori's History of Mathematics: $3.50; Macmillan Co. Cajori is the first American historian of general mathematics. His book is one of the best published in the English language, and treats the subject from the earliest beginning of science up to the present time.

Cajori's Elementary History of Mathematics: $1.50; Macmillan Co. This valuable little book is partly an abbreviation of the "History of Mathematics," with particular reference to the elementary branches of mathematics and the teaching of mathematics. In addition, it contains an interesting historic account of the so-called "modern geometry of the triangle," which should prove particularly interesting for high school teachers.

Cajori's History and Teaching of Mathematics in the United States: Bureau of Equipment, Department of the Interior, Washington, D. C. Every teacher of mathematics in the United States ought to be familiar with this work.

Ball's History of Mathematics: $3.25; Macmillan Co.

Ball's A Primer History of Mathematics: 65c; Macmillan Co.

Both of these books give an interesting account of the history of mathematics from an English standpoint. For this reason, references to

English authors and mathematics should be studied in comparison with Cajori's and Fink's histories.

Fink's Brief History of Mathematics: $1.00; Open Court Publishing Co. An admirable translation of Fink's Geschichte der Elementar Mathematik. It is not as extended as Cajori's history and should also be met with favor. Biographical notes of mathematicians are added at the end of the book.

Young's Teaching of Mathematics in Prussia, $1.00; Longmans, Green & Co. Professor Young of Chicago University has personally investigated the school systems of Prussia. His report contains many valuable suggestions and should be extensively read.

Gow's Greek Mathematics: $3; Macmillan Co. Everybody interested in the achievements of the giant minds of antiquity should study Gow's book. It is inspiring for the teacher.

De Morgan's Study and Difficulties in Mathematics: $1.00; Open Court Publishing Co. De Morgan is one of the greatest logicians of mathematics. His thorough grasp of the philisophy of mathematics and the fluent expression of a polished language make all of De Morgan's writings fascinating, and it is profitable to read them.

McLellan and Dewey's Psychology of Number: $1.50; D. Appleton & Co.

Dedekind's Essays on Number: $1.00; Open Court Publishing Co. These are two essays which touch upon the foundations of mathematics, a subject that stands in the foreground of modern mathematical interest. They are also typical. The first lays particular stress upon psychology, the other, however, upon the pure mathematical concept.

Ball's Mathematical Recreations: $2.50; Macmillan Co. Paradoxes in Arithmetic, Algebra and Geometry, artifices with numbers, mathematical plays and games, etc., form the contents of this interesting book. Its excellency may be judged from the fact that it called forth a French translation.

Schubert's Mathematical Essays: $1.00; Open Court Publishing Co. Treats of the three famous problems of antiquity; the doubling of the cube (Delian problem), the trisection of the angle, and the squaring of the circle. It contains also an instructive account of the fourth dimension. Prof. Schubert is well known to the American scientific public through his writings in the "Monist."

Dodgson's Curiosa Mathematica: 75c; Macmillan Co. Mathematical curiosities which may be used in supplementing Ball's and Schubert's works.

Whitworth's Choice and Chance: $2.25; Macmillan Co.. A masterly exposition of mathematical probabilities and their applications.

Laplace's Philosophical Essay on Probabilities: $1.50; John Wiley & Sons. An English translation of Laplace's introduction to his celebrated Calculus of Probabilities.

Connant's Number Concept: $2.00; Macmillan Co. A masterly historic and critical acount of the origin and development of number-systems.

Fine's Number Systems of Algebra: $1.00; Leach, Shewell & Sanbor. History and theory of rational, irrational and complex numbers.

Arithmetic.

Ray's Higher Arithmetic: $1.00; American Book Co.

Beman & Smith's Higher Arithmetic: $1.00; Ginn & Co.

The Science of Arithmetic: Olney. $1.00; Sheldon & Co.

These are standard books and contain much valuable information for the teacher of arithmetic.

McLellan's "Public School" Series of Arithmetic. Four Parts: $1.75; Macmillan Co. Based on McLellan and Dewey's Psychology of Number. This series involves many new ideas in the methods of teaching arithmetic.

Finkel's Arithmetical Solution Book: $1.00; Kibler, Cokeley & Co., Kidder. One of the best and complete collections of arithmetical problems.

Algebra.

The Hall & Knight Series on Algebra: $2.60; Macmillan Co.

Taylor's Elements of Algebra: $1.50; Allyn & Bacon.

Jarman's Algebraic Factors: 75c; Macmillan Co.

These are three good books for elementary work. For other standard works, like Wentworth's, etc., reference is made to the catalogues of various publishers.

Geometry.

The Foundations of Geometry: Hilbert. $1.00; Open Court Publishing Co. Within a few years this fundamental work of Hilbert has been translated into French and English. It deals with the postulates and axioms of geometry in a new and original manner and has attracted the attention of mathematicians all over the world.

Casey's Sequel to Euclid: $1.00; Hodges, Figgis & Co. A rich collection of advanced problems in plane geometry. The proves are mostly metrical. Numerous original problems at the end of every chapter give the student an opportunity for independent work.

Mahler's Ebene Geometrie: 25c; Goeschen, Stuttgart. An admirable little book. The figures are in two colors, which adds materially to the efficiency of the book.

Holgate's Elementary Geometry, Plane and Solid: $1.50; Macmillan Co. Distinguished by the accuracy of the statements and proofs. Reviews at the end of each chapter form one of the valuable features of the book.

Geometric Exercises in Paper Folding: Sundara Row. $1.00; Open Court Publishing Co. Many new ideas for the teaching of elementary geometry may be gained from this original treatment of geometric problems.

Reye's Geometry of Position: $2.00; Macmillan Co. A systematic treatment of projective geometry by one of the best authorities on this subject. The superiority of projective methods in the treatment of conics and other products of projectivity appears conclusively from this treatise. It is elementary and accessible to readers of moderate geometrical training.

Trigonometry.

Ashton and Marsh's Plane Spherical Trigonometry: Charles Scribner's Sons, 1902.

Crockett's Elements of Plane and Spherical Trigonometry and Tables: American Book Co.

Graphics.

Wilson's Graphics: $4.00; Macmillan Co. A treatise on the art of drawing, lettering, rendering, descriptive geometry, shades, shadows and perspective, tracing of curves, etc. It is a standard work and its typography is unexcelled.

Walter's Course in Drawing: $1.00; Crane, Topeka. A systematic treatise based upon geometrical and lineal drawing.

MacCord's Elements of Descriptive Geometry: $3.00; John Wiley & Sons.

Wolf's Elementary Course in Descriptive Geometry: $3.00; John Wiley & Sons.

It is desirable that in the teaching of geometry to beginners, extensive use should be made of constructions, models and graphic representations. In other words, a closer relation between geometry and graphics should be established. Of course, the foregoing works could not be used as text-books in this connection, but they may offer guiding principles also for elementary instruction.

General Mathematics.

Goodwin's Elementary Course of Mathematics: $3.00; Deighton, Bell & Co.

Davies & Peck's Mathematical Dictionary: $4.00; A. S. Barnes & Co.

Elwood's Problems in Arithmetic, Algebra and Geometry: $1.00; American Book Co.

Holzmüller's Methodisches Lehrbuch der Elementar Mathematik: $3.00; Teubner, Leipzig.

All four books mentioned above contain much valuable material in the different branches of elementary mathematics. Holzmüller's Methodisches Lehrbuch der Elementar Mathematik is a typical German textbook by an author who stands high in his profession.

V. GEOLOGY AND PHYSIOGRAPHY.

Text-Books of Like Grade.

A Commercial Geography: Adams. D. Appleton & Co., 1901. (Twentieth Century Text-Books). Very good.

Elementary Physical Geography: Davis. Ginn & Co., 1902. A text which is in every way standard, written by the leader of physiography in the United States. It is a little difficult for lower classes in high schools and for teachers who have no preparation outside the text book.

Physical Geography: Dryer. American Book Co. A book by an up-to-date teacher, reliable and easier than Davis. It contains many descriptions of parts of the United States.

Introduction to Physical Geography: Gilbert and Brigham. D. Appleton & Co., 1902. A very attractive book for text or reading. Mr. Gilbert has long been prominent on the United States Geological Survey, and Prof. Brigham is an up-to-date teacher of geology.

Teachers' Guide and Laboratory Exercises: Gilbert and Brigham. (To accompany above work.)

Physical Geography: Tarr. Macmillan Co. A very readable text, which is generally liked by students. The book is rather larger than others, but not more difficult.

Elementary Physical Geography: Redway. Charles Scribner's Sons, 1901.

Common Minerals and Rocks: Crosby. D. C. Heath & Co.

Minerals, and How to Study Them: Dana. Wylie & Sons.

The last two mentioned texts are the best which can be recommended for teachers who wish to acquire familiarity with minerals by home work. Either should be accompanied by sets of typical specimens. Advertisements of such may be obtained by writing to E. E. Howell, 612 Seventeenth street N. W., Washington, D. C. $1.50 up.

Geologies for Reference and Advanced Reading.

An Introduction to Geology: Scott. Macmillan Co. A thoroughly good text, not too difficult for students who wish to read something in advance of what they get in the high-school course in physical geography. It is sufficiently complete to be used as a reference book.

Compend of Geology: Le Conte. Can be used easily by high-school pupils. It is a popular book, by one of the most eminent of American geologists.

Elements of Geology: Le Conte. D. Appleton & Co. A very good book for teachers. It is sufficiently complete for a reference book for pupils and teacher.

A Text-Book of Geology: Brigham. D. Appleton & Co., 1901. Written for high schools, and might be used with upper classes instead of physical geography. If a text in geology is to be used at all in high schools of this State, this one is not excelled by any now in print.

Economic Geology of the United States: Tarr. Macmillan Co. Should be on hand as a reference book, but it is also a very readable book, and will doubtless be much used by pupils who are interested in science.

Elementary Meteorology: Davis. Ginn & Co. A standard work, explaining the phenomena of the atmosphere. It affords the best preparation to those who must teach the physical geography of the air.

Collateral Reading.

Physiography of the United States: American Book Co. A series of monographs on general processes and on various areas of the United States. It should be read through thoroughly by every teacher of physical geography, and will delight many pupils.

Realm of Nature: Mill. Charles Scribner's Sons. One of the best books for reading and reference, both for teacher and pupil. It supplements rather than duplicates the text.

Lakes of North America: Russell. Ginn & Co.

Glaciers of North America: Russell. Ginn & Co.

Rivers of North America: Russell. G. P. Putnam's Sons.

Volcanoes of North America: Russell. G. P. Putnam's Sons.

The four last mentioned texts are called reading books in physical geography. They are written in popular style, much more extended, but not more difficult, than the text book. They can be used from eighth grade to college, inclusive.

Physiography: Huxley. D. Appleton & Co. The principles of physiography applied to the Thames Basin, showing their influence on the scenery and conditions of life.

Lessons in the New Geography: Trotter. D. C. Heath & Co. The treatment of a few phases of physical geography in such a way as to show its relations to other sciences and to life in general.

Story of Our Continent: Shaler. Some of the elementary facts of geology so related as to be understood by all and to show their close relation to conditions of life.

Aspects of the Earth: Shaler. Charles Scribner's Sons. A series of descriptions of interesting phenomena, written in fine style, and calculated to stimulate further study.

Rocks, Rock Weathering and Soils: Merrill. Macmillan Co. A book for teachers and to which the more advanced pupils may be referred. It should make the teacher familiar with many common phenomena of rocks, which are the best possible material for outdoor lessons.

International Geography: Mill. $3.50; D. Appleton & Co. A 1,100-page handbook of geography, physical, political, etc., written by eminent authorities on each country. The book is highly interesting as a reading book, text or reference book.

Economic Interpretation of History: Seligman. Macmillan Co., New York. This book is exceedingly valuable for every teacher of history and geography.

Journals.

Journal of Geography: $1.50 year. Address, The editor of the Journal of Geography, Winona, Minn. A journal whose purpose it is to stimulate both the study and the teaching of geography. Its articles abound in illustrations of the relations of geography to life.

National Geographic Magazine: $2, if the principal becomes a corresponding member of the National Geographic Society. Write to The National Geographic Society, Washington, D. C., asking for information about membership. The $2 cover all fees. A magazine similar to the one just mentioned, which pays less attention to the teaching of the subject, but contains valuable geographic material.

VI. BOTANY.

Texts.

Plants, a Text-Book of Botany: Coulter. This is one of the most recent text-books of a general nature, giving an introduction to all the lines of botanical work. The language is simple, the subject matter accurate.

Morphology of Spermatophytes: Coulter and Chamberlain. Twentieth Century Text-Book; D. Appleton & Co.

Botany All the Year Round: E. F. Andrews. American Book Co., 1903. Contains useful list of reference books, etc.

Elementary Text-Book of Botany: Vines. This is not really "elementary," but a rather extended work, written in technical language. Accurate.

Plant Physiology: Ganong. A laboratory manual, giving directions for experimentation and study. Many of the experiments described can be performed with simple apparatus.

Practical Botany: Strasburger and Hillhouse. This is a laboratory manual, giving directions for morphological study. Very valuable to the teacher who has not had extensive training in laboratory methods.

Key to the Rocky Mountain Flora: Nelson. A book giving descriptions of the more common plants of the region, with keys for their identification. Useful in giving pupils a start in the study of systematic botany.

Manual of Rocky Mountain Flora: Coulter. Issued twenty years ago, and hence very incomplete. It is, however, the only manual which gives most of the seed plants of the region.

Manual of the Plants of the Northeastern States: Britton. A strictly modern work, describing the plants of the region named, and giving most of the plants growing on the plains of Colorado.

Plant Physiology: Reynolds Green. One of the most recent and best accounts of the phenomena of plant life. It is written in a readable style.

Natural History of Plants: Kerner and Oliver. A four-volume work of great interest. It discusses all phases of botanical study, and is useful as a reference work, especially in ecology.

The Teaching Botanist: Ganong. A book of essays on the subjects to be chosen for presentation and errors more commonly made by teachers, with a discussion of the relation of botany to the other sciences, and of the sciences to other subjects in the high school curriculum.

From the Greeks to Darwin: Osborn.

Darwin: Any or all of the works of this great master.

The Foundations of Botany: Bergen. (Rocky Mountain Edition); Ginn & Co., New York, 1901.

Botany, an Elementary Text-Book: L. H. Bailey; Macmillan Co., 1901.

The Survival of the Unlike: L. H. Bailey. Macmillan Co., 1896.

Journals.

The Botanical Gazette, University of Chicago, monthly, $4.00.

Bulletin of the Torrey Botanical Club, Lancaster, Pa., $2.00.

Forest Leaves, Pennsylvania Forestry Association, Philadelphia, bi-monthly, $1.00.

The Plant World, Binghamton, N. Y., bi-monthly, $1.00.

Science, Lancaster, Pa.; Macmillan Co., weekly, $5.00.

VII. ZOOLOGY.

Outlines of Zoology: Thomson. A modern work, giving the best one-volume account of the animal kingdom yet written.

Practical Zoology: Marshall and Hurst. A valuable laboratory manual, giving minute and accurate directions for the dissection of certain animals.

The Human Body (advanced course): Martin. This is the standard reference book for general subjects of anatomy and physiology of animals. It is rather non-technical, as compared with text-books of physiology used in medical schools.

Animal Life: Jordan and Kellogg. Devoted to the structure and habits of animals. Quite elementary, but very useful in describing features of ecological significance not treated in most texts.

Manual of Vertebrates: Jordan. A work to be used for the classification and identification of vertebrate animals.

Study of Animal Life: Thomson. A condensed account of the life histories and habits of animals, with allusions to the origin of variations and to evolutionary subjects generally.

Introduction to Zoology: Schmeil. A semi-popular work, describing some of the better known animals of the different phyla. Excellent for ecology. Not always strictly accurate in morphological questions.

Naturalist on the Amazon: Bates. Interesting accounts of animals and their habits, with discussions of evolutionary topics.

Ants, Bees and Wasps: Lubbock. The only work which is full and accurate covering the subject. Written in an easy style.

Darwin and After Darwin: Romanes. An account of the development of the doctrine of evolution by one of Darwin's contemporaries.

Text-Book of Zoology: Parker and Haswell. 2 vols. An excellent general text. Examples are given of the different phyla and comparisons made with other related genera.

From the Greeks to Darwin: Osborn. A general historical account of the development of the doctrine of evolution from the earliest times.

The Descent of Man; The Origin of Species, etc.: Darwin. The teacher should be familiar with some of the writings of the greatest naturalist who ever lived.

Darwinism: A. R. Wallace. Macmillan Co., 1891. A good epitome.

Life and Letters of Huxley. 2 vols.; Macmillan Co., 1900.

Life and Letters of Darwin: 2 vols.; D. Appleton & Co., 1887.

The Foundations of Zoology: W. K. Brooks. Macmillan Co., 1899.

Animal Life and Intelligence: C. Lloyd Morgan. Ginn & Co., 1895.

Animal Behavior: C. Lloyd Morgan. Edward Arnold, 1900.

Man's Place in Nature: Huxley. Macmillan Co., 1895.

VIII. PHYSIOLOGY.

Martin's Human Body: (Advanced course). Henry Holt & Co. Good general reference work.

Stirling's Practical Physiology: P. Blakiston Son & Co. This is a laboratory guide.

Thomson's Outlines of Zoology: D. Appleton & Co. Chapters 2, 3, 4 and 17 contain useful physiological material.

Waller's Human Physiology: Longmans, Green & Co. A perfectly safe reference book in all cases. The most reliable and scholarly work there is in one volume.

James' Psychology: Henry Holt & Co. Useful for reference in the work on the senses and sense organs and on the physiology of the brain and the nervous system generally.

Lectures on the Action of Medicines: Brunton. Macmillan Co., 1890.

The Physiology of the Senses: McKendrick and Snodgrass. Charles Scribner's Sons, 1893.

IX. PHYSICS.

Probably the best text-books in Physics for high school use are Carhart & Chute's, and Hoadley's. The former is particularly well adapted to a course, in which laboratory work occupies a large part of the student's time, and the latter is written in a clear and engaging manner, and contains descriptions of a large number of exceedingly interesting experiments.

The following books are adapted to the needs of students in a first-year University course. They are intended to be used as text-books in such a course, but may be used as reference books in high school work:

General Physics: Hastings and Beach.

University Physics: Carhart.

Theory of Physics: Ames.

Physics: Barker.

Natural Philosophy: Deschanel.

Text-book of Physics: Anthony and Bracket.

Elements of Physics: Henderson and Woodhull; D. Appleton & Co., 1900.

Riecke's Experimental Physik, published in German, is also a good book of much the same character as the above.

The following books are of about the same grade as the above list, but are fuller in detail, and better adapted for use as reference books:

Text-book of the Principles of Physics: Daniel.

Physics: Ganot.

The following books are of an interesting and popular nature:

Heat a Mode of Motion: Tyndall.

On Sound: Tyndall.

On Light: Tyndall.

Popular Scientific Lectures: Ernst Mach. Translated by McCormack.

S. P. Thompson's Electricity and Magnetism is a delightful and altogether admirable book on the subject, well adapted for use as a text-book in a first-year University course, or as a reference book for students of elementary electricity.

Preston's Theory of Light and Theory of Heat are admirable on the subjects, adapted for use as reference books or as text-books in second year courses in University work. For the most part they are descriptive, but in parts require a slight acquaintance with Calculus.

A Text-Book of Astronomy: Comstock; D. Appleton & Co., 1901.

Scientific Memoirs: Edited by Joseph S. Ames, Professor of Physics and Director of the Physical Laboratory, Johns Hopkins University. Fifteen volumes, bound in cloth, about 150 pages each, prices varying from 60c to $1.00 per volume; American Book Co., New York, 1898 to 1902. This is a physical classic series, consisting of translations or reprints of memoirs of the discoverers in physical science from its rise to the present day. Each subject is treated in one volume and has a separate editor. The editor has selected memoirs and parts of memoirs bearing on the subject, adding notes from his own hand for connection and elucidation. Each volume also contains a short preface, chiefly historical, and a short biographical sketch of each of the writers from whose memoirs he has selected. References to allied papers are found in a bibliography at the end of each volume. The series offers no particular mathematical difficulties to the average reader and presents, on the whole, delightful reading to any one at all interested in the subjects treated. Following is a list of the memoirs:

The Free Expansion of Gases: Memoirs by Gay-Lussac, Joule, and Joule and Thomson. Edited by Dr. J. S. Ames, Johns Hopkins University.

Prismatic and Diffraction Spectra: Memoirs by Joseph von Fraunhofer. Translated and edited by Dr. J. S. Ames, Johns Hopkins University.

Röntgen Rays: Memoirs by Röntgen, Stokes, and J. J. Thomson. Translated and edited by Dr. George F. Barker, University of Pennsylvania.

The Modern Theory of Solution: Memoirs by Pfeffer, Van't Hoff, Arrhenius and Raoult. Translated and edited by Dr. H. C. Jones, Johns Hopkins University.

The Laws of Gases: Memoirs by Boyle and Amagat. Edited by Prof. Carl Barus, Brown University.

The Second Law of Thermodynamics: Memoirs by Carnot, Clausius and Thomson. Translated and edited by Prof. W. F. Magie, Princeton University.

The Fundamental Laws of Electrolytic Conduction: Memoirs by Faraday, Hittorf, and Kohlrausch. Edited by Dr. H. M. Goodwin, Massachusetts Institute of Technology.

The Effects of a Magnetic Field on Radiation: Memoirs by Faraday, Kerr and Zeeman. Edited by Dr. E. P. Lewis, University of California.

The Laws of Gravitation: Memoirs by Newton, Bouguer, and Cavendish. Translated and edited by Prof. A. S. Mackenzie, Bryn Mawr College.

The Wave Theory of Light: Memoirs by Huygens, Young, and Fresnel. Translated and edited by Prof. Henry Crew, Northwestern University.

The Discovery of Induced Electric Currents: Vol. I. Memoir by Joseph Henry. Edited by Dr. J. S. Ames.

The Discovery of Induced Electric Currents: Vol. II. Memoir by Michael Faraday. Edited by Dr. J. S. Ames.

The Foundations of Streo-Chemistry: Memoirs by Pasteur, Van't Hoff, Le Bel and Wislicenus. Translated and edited by Prof. G. M. Richardson, Leland Stanford, Jr., University.

The Expansion of Gases: Memoirs by Gay-Lussac and Regnault. Translated and edited by Dr. W. W. Randall, Mackenzie School.

The Laws of Radiation and Absorption: Memoirs by Prévost, Stewart Kirchhoff, and Bunsen. Edited by Prof. D. B. Brace, University of Nebraska.

X. CHEMISTRY.

A Treatise on Chemistry: Vol. I, Vol. II, Parts 1 and 2, 3 vols. Roscoe and and Schorlemmer. D. Appleton & Co.

The Principles of Theoretical Chemistry: Remsen. Lea Bros., Philadelphia.

History of Chemistry: Ladenburg. Simpkin, Marshall, Hamilton, Kent & Co.

Qualitative Analysis: Prescott and Johnson. Fifth edition; D. Van Nostrand.

Quantative Analysis: Fresenius. New system; John Wiley & Sons

Physical Chemistry for Beginners: Van Deventer. John Wiley & Sons.

Organic Chemistry: Richter. P. Blakiston & Co.

Outline of Industrial Chemistry: Thorpe. Macmillan Co.

Manual of Assaying: Brown. E. H. Sargent & Co., Chicago.

Elements of Metallurgy: Harrison. Blackie & Son.

The Atomic Theory: Wurtz. D. Appleton & Co.

The Gases of the Atmosphere: Ramsey. Macmillan Co.

The Chemistry of Photography: Mendola. Macmillan Co.

The following books may be found useful, but are, however, somewhat more advanced and more expensive.

History of Chemistry: Ernst von Meyer. Macmillan Co.

Outlines of General Chemistry: Ostwald. Macmillan Co.

Principles of Chemistry: Muir. Macmillan Co.

Treatise on Chemistry: Roscoe and Schorlemmer. Vol. III; D. Appleton & Co.

Manual of Practical Assaying: Furman. John Wiley & Sons.

Qualitative Analysis: Fresenius. John Wiley & Sons.

Any of the above books can be obtained at a discount of 20 per cent. from D. Van Nostrand & Co., 23 Murray street, New York.

XI. APPLIED SCIENCE.

Scientific books introductory to applied science for engineering and technical schools:

Modern Framed Structures: Johnson. $10.00; John Wiley & Sons. A treatise on steel building, bridge and other designs.

Sewage, and the Bacterial Purification of Sewage: Rideal. $3.50; John Wiley & Sons. A treatise on the drainage of cities and towns, and the scientific treatment of their refuse matters and waste products.

Water Supply, Chemical and Sanitary: Nichols. $2.50; John Wiley & Sons. A treatise on the supply of water to cities, and the chemical process for purification of drinking waters.

Descriptive Geometry: MacCord. $3.00; John Wiley & Sons. A text-book for schools and colleges on the elements of descriptive geometry.

Highway Construction: Byrne. $5.00; John Wiley & Sons. A book explaining the methods of constructing the various kinds of roads known to the civil engineer.

Elementary Lessons in Electricity and Magnetism: Thompson. $1.40; Macmillan Co. A good general text-book, introducing the science of electricity and magnetism.

Railroad Construction—Theory and Practice: Walter L. Webb. $4.00; John Wiley & Sons. A book treating concisely the various problems to be dealt with in building a railroad.

Engineering and Architectural Jurisprudence: Wait. $6.00; John Wiley & Sons. A treatise explaining the law as pertaining to engineering contracts, specifications and work.

Modern American School Building: Birkmire. $4.00; John Wiley & Sons. An architectural and structural treatment of the design of school buildings.

Simple Elements of Navigation: Young. $2.00; John Wiley & Sons. A text book relating to the problems of finding one's position at sea.

Notes on Assaying: Ricketts and Miller. $3.00; John Wiley & Sons. A general treatment of the problems of determining the values of ores.

Practical Astronomy, as Applied to Geodesy and Navigation: Doolittle. $4.00; John Wiley & Sons. A text-book treating of the problems to be met by the geodesist in studying the size and figure of the earth, and in making world surveys.

Elements of Geodesy: Gore. $2.50; John Wiley & Sons. An elementary treatise on geodetic surveying.

Topographical Surveying: Wilson. $3.50; John Wiley & Sons. A treatise on surveying in general, and on the making of maps.

Treatise on Hydraulics: Merriman. $4.00; John Wiley & Sons. A general text-book treating the laws governing the flow of water.

Water Supply: Turneaure and Russell. $5.00; John Wiley & Sons. A book explaining the problems to be met in building the waterworks of cities.

Irrigation Engineering: Wilson. $4.00; John Wiley & Sons. A book explaining the problems to be met in building irrigation systems.

Masonry Construction: Baker. $5.00; John Wiley & Sons. A treatise discussing the materials used in building masonry constructions, and explaining the processes of construction.

General Astronomy: Young. $2.75; Ginn & Co. A text-book treating of the general problems of astronomy, explaining astronomical instruments and describing celestial phenomena.

Explosives: Eissler. $4.00; John Wiley & Sons. A thorough outline of explosives, their compositions, manufacture and use.

Sewerage: Folwell. $3.00; John Wiley & Sons. A text-book outlining the problems of sewer design for cities and towns.

Water Supply Engineering: Folwell. $4.00; John Wiley & Sons. A text-book outlining the problems of waterworks design for cities and towns.

Mechanical Engineering of Power Plants: Hutton. $5.00; John Wiley & Sons. A descriptive treatise of engines and boilers and all machinery for producing power.

Theory and Practice of Surveying: Johnson. $4.00; John Wiley & Sons. An excellent text-book, describing the instruments used by the surveyor, and explaining the methods of making all kinds of surveys.

Civil Engineering: Patton. $7.50; John Wiley & Sons. A general treatise, describing the problems of bridge, highway, railroad, etc., designs.

Hydraulic Cement: Spaulding. $2.00; John Wiley & Sons. A book explaining the process of manufacture and the use of cements and mortars.

XII. PSYCHOLOGY.

General Psychology—Systematic Treatises.

Principles of Psychology: James. 2 vols.; Holt & Co.; Macmillan Co. Abridged and briefer course.

Psychology, Descriptive and Explanatory: Ladd. Charles Scribner's Sons; Longmans, Green & Co. Abridged in Elements of Descriptive Psychology.

Analytic Psychology: Stout. 2 vols.; Swan, Sonnenschein & Co; Macmillan Co.

Lectures on Human and Animal Psychology: Wundt.

Outlines of Psychology: Höffding. Macmillan Co.

The Power of Thought: Sterrett. Charles Scribner's Sons.

Handbook of Psychology: Baldwin. 2 vols.; Henry Holt & Co.; Macmillan Co. Abridged in Elements of Psychology.

Story of the Mind: Baldwin. D. Appleton & Co.

Articles in Johnson's Universal Cyclopedia: Baldwin. Johnson Company, New York.

Psychology of the Child.

The Mind of the Child: Preyer. 2 vols.; D. Appleton & Co.

Intellectual and Moral Development of the Child: Compayre. 2 vols.; D. Appleton & Co.

Studies of Childhood: Sully. D. Appleton & Co.; Longmans, Green & Co.

Mental Development in the Child and the Race: Baldwin. Macmillan Co.

Introduction to Psychology: Calkins. Macmillan Co., 1901.

Psychology of Childhood: Tracy. Boston, 1894.

The Child; A Study in the Evolution of Man: Chamberlain. New York, 1900. Contains the best summary of facts in child psychology and best bibliography yet published.

Physiological Psychology.

Introduction to Physiological Psychology: Ziehen. Swan, Sonnenschein & Co.; Macmillan Co.

Elements of Physiological Psychology: Ladd. Charles Scribner's Sons; Longmans, Green & Co. Abridged in Outlines.

The Growth of the Brain: Donaldson. Walter Scott; Charles Scribner's Sons.

Experimental Psychology.

Outline of Psychology: Külpe. Swan, Sonnenschein & Co.; Macmillan Co.

Course in Experimental Psychology: Sanford. D. C. Heath & Co.

The New Psychology: Scripture. Walter Scott; Charles Scribner's Sons.

Analytical Psychology: Witmer. Ginn & Co.

Experimental Psychology: Titchener. 2 vols.

Animal and Evolutionary Psychology.

Mental Evolution in Animals and Man: Romanes. 2 vols.; D. Appleton & Co.

Animal Intelligence: Romanes. D. Appleton & Co.

Darwin and After Darwin: Romanes. 3 parts; Open Court Publishing Co.; Longmans, Green & Co.

Comparative Psychology: C. Lloyd Morgan. W. Scott; Charles Scribner's Sons.

Animal Life and Intelligence: C. Lloyd Morgan. Edward Arnold.

Habit and Instinct: C. Lloyd Morgan. Edward Arnold.

Animal Behaviour: C. Lloyd Morgan. Edward Arnold.

The Play of Animals: Groos. D. Appleton & Co.; Chapman & Hall.

The Play of Man: Groos. D. Appleton & Co.

Principles of Psychology: Spencer. 2 vols.; D. Appleton & Co.

The Naturalist in La Plata: Hudson. Chapman & Hall.

Descent of Man: Darwin. D. Appleton & Co.

Origin of Species: Darwin. D. Appleton & Co.

Darwinism: Wallace. Macmillan Co.

Origin and Growth of the Moral Instinct: Sutherland. Longmans, Green & Co., 1898, 2 vols.

The Evolutionary Psychology of Feeling: Stanley. Swan, Sonnenschein & Co.; Macmillan Co.

Mental Development in the Child and the Race: Baldwin. Macmillan Co.

Mental Defect and Disease.

Pathology of Mind: Maudsley. Macmillan Co.

Familiar Forms of Nervous Disease: Starr. Wood, New York.

The Faculty of Speech: Collins. Macmillan Co.

Genius and Degeneration: Hirsch. D. Appleton & Co.

Dictionary of Psychological Medicine: Tuke. P. Blakiston, Son & Co.

Diseases of the Will. Ribot. Open Court Publishing Co.

Diseases of Memory: Ribot. Open Court Publishing Co.

Hypnotism and Allied Topics.

Hypnotism: Moll. Walter Scott; Charles Scribner's Sons.

Alterations of Personality: Binet. D. Appleton & Co.; Chapman & Hall.

Hallucinations and Illusions: Parish. Walter Scott; Charles Scribner's Sons.

Social and Ethical Psychology.

The Laws of Imitation: Tarde. Henry Holt & Co.

The Crowd: Le Bon. Walter Scott; Charles Scribner's Sons.

Studies in Good and Evil: Royce. D. Appleton & Co.

Social and Ethical Interpretations in Mental Development: Baldwin. Macmillan Co.

Educational Psychology.

The Story of the Mind: J. M. Baldwin. 40c: D. Appleton & Co.

On Education: Spencer. D. Appleton & Co.

Education and Heredity: Guyau. Charles Scribner's Sons.

The Application of Psychology to Education: Herbart. Charles Scribner's Sons.

The Psychologic Foundations of Education: Harris. D. Appleton & Co.
Talks to Teachers on Psychology: James. Henry Holt & Co.
Genetic Psychology for Teachers: Judd. D. Appleton & Co.

Philosophy.

Introduction to Philosophy: Paulsen. Henry Holt & Co.
The Spirit of Modern Philosophy: Royce. Houghton, Mifflin & Co.
Basal Concepts in Philosophy: Ormond. Charles Scribner's Sons.
The Will to Believe: James. Longmans, Green & Co.

Psychology and Philosophy.

(Over the Whole Field.)

Baldwin's Dictionary of Philosophy and Psychology, with full bibliographies, French, German, and Italian equivalents, etc., 3 vols.; Macmillan Co.

Unclassified.

Principles of Sociology: Spencer. D. Appleton & Co.
Principles of Sociology: Giddings. Macmillan Co.
Introduction to Social Philosophy: Mackenzie. Macmillan Co.
Pain, Pleasure, and Æsthetics: Marshall. Macmillan Co.
Inquiries into Human Faculty: Galton. Macmillan Co.
Natural Inheritance: Galton. Macmillan Co.
The Chances of Death: Pearson. 2 vols.; Edward Arnold.

Journals.

The Psychological Review: All departments: Macmillan Co.
The American Journal of Psychology: Orpha, Worcester. Experimental.
Mind: Williams and Norgate. Mainly for philosophy.
Pedagogical Seminary: Worcester, Mass.

XIII. MISCELLANEOUS BOOKS ON SCIENCE.

The study of the history of science is helpful, not only in surmounting difficulties, but by adding interest and zeal to the work. A few biographies are given below:

Michael Faraday, His Life and Work: S. P. Thompson. Century Science Series, $1.25; Macmillan Co.

Pioneers of Science: O. J. Lodge. $2.50; Macmillan Co.

Pasteur: P. Frankland. Century Science Series. $1.25; Macmillan Co.

Humphrey Davey, Poet and Philosopher: T. E. Thorpe. Century Science Series. $1.25; Macmillan Co.

Charles Darwin and the Theory of Natural Selection: E. B. Poulton. Century Science Series, $1.25; Macmillan Co.

James Clerk Maxwell, and Modern Physics: B. T. Glazebook. Century Science Series, $1.25; Macmillan Co.

John Dalton: Roscoe. Century Science Series, $1.25; Macmillan Co.

Short History of Chemistry: Venable. $1.00; D. C. Heath & Co. The best short work on the history of chemistry.

Discoveries and Inventions of the Nineteenth Century: A scientific manual for reading and reference. 12th edition, illustrated, $2.50; George Rutledge & Son. Deals with a very wide range of scientific discoveries to 1897.

Progress of the Century: $2.00; Harper & Bros. A valuable series of papers by the leaders of thought dealing with the progress of thought in the Nineteenth Century.

Experimental Science: George M. Hopkins. $4.00; Munn & Co. A popular account of physical phenomena. A great favorite with young people.

Popular Books on Science: Arabella D. Buckley. D. Appleton & Co.; Geo. N. Morang & Co.

Short History of Natural Science, and of the Progress of Discovery from the Time of the Greeks Until the Present Day: For the use of schools and young persons. New edition, revised and re-arranged, cloth, $2.00.

Fairy Land of Science: Illustrated, cloth, $1.50.

Life and Her Children: Glimpses of animal life from the amœba to the insects. Illustrated, cloth, $1.50.

Winners in Life's Race, or the Great Backboned Family: Illustrated, cloth, $1.50.

Through Magic Glasses: A sequel to the Fairy Land of Science, $1.50.

Boys' Book of Inventions: R. S. Baker. Illustrated, $2.00; Doubleday, Page & Co.

On the Origin of Species: Six lectures to workingmen. Prof. Huxley. $1.00; D. Appleton & Co.; Geo. N. Morang & Co. A simple presentation of the subject treated of in Darwin's work, $1.40; George Rutledge & Co.

In Nature's Workshop: Grant Allen. Illustrated, $1.25; William Briggs.

Flame, Electricity and the Camera: George Iles. Illustrated, $2.00; Doubleday, Page & Co.

Everyday Birds: Elementary Studies. Torrey. Illustrated, 75c; Houghton, Mifflin & Co.

Bird Life: A guide to the study of our common birds. Frank M. Chapman. With 75 full-page colored plates, after drawings by Ernest Seton-Thompson, net $2.00; William Briggs. The early chapters define the bird, its place in nature, its relation to man, describing the colors, migrations, voices and habits of different varieties. The concluding chapters present the portraits, names and addresses of more than one hundred birds of Eastern North America.

Familiar Fish. Their Habits and Culture: Eugene McCarthy. $1.50; D. Appleton & Co.; Geo. N. Morang & Co.

Our Insect Friends and Foes: How to collect, preserve and study them. Belle S. Cragin. $1.75; G. P. Putnam's Sons. A work for boys and girls; popular in style.

Insect World: C. M. Weed. Home Reading Book Series, 60c; D. Appleton & Co.; George N. Morang & Co. Popular in style.

Mosquitoes: L. O. Howard, Chief Entomologist Department of Agriculture, Washington. Profusely illustrated, $1.50; McClure, Phillips & Co. The author tells how mosquitoes live, how they carry disease, how they are classified and how they may be destroyed.

How to Know the Wild Flowers: Mrs. William Starr Dana (Miss Parsons). Illustrated, $2.00 net, Charles Scribner's Sons; William Briggs. The flowers are arranged according to color. Does not require technical knowledge. The romantic, legendary, literary and other associations are dealt with.

How to Know the Ferns: Mrs. Dana. $1.50 net; Charles Scribner's Sons. A book of the same type as the preceding.

Guide to Wild Flowers: Alice Lounsberry. Illustrated, $2.50; William Briggs.

Mushroom Book: N. L. Marshall. Illustrated, $3.00; William Briggs.

Bird Portraits: Seton-Thompson. Quarto, cloth, $1.50; Ginn & Co. Pictures by the artists of familiar birds, printed on heavy coated paper, 8½ by 12 inches in size. Descriptions by Mr. Hoffman of the Audubon Society, accompany Mr. Seton-Thompson's pictures. Seton-Thompson's other works are, of course, also very interesting and useful.

Wasps and Their Ways: Margaret W. Morley. 8vo., cloth $1.50; Dodd, Mead & Co. A study of wasps for the general reader. The book deals with the habits, the structure and the history of wasps, and particularly their relations to man. With many illustrations, microscopic and otherwise, from personal observation of the author.

Squirrels and Other Fur-Bearers: John Burroughs. Cloth, $1.00. School edition, 60c net; Houghton, Mifflin & Co. With fifteen illustrations in color after Audubon, and a frontispiece from life.

Moths and Butterflies: Mary C. Dickerson. Large 8vo, cloth, $2.50, Ginn & Co.; The Copp, Clark Co. Three hundred illustrations, specially prepared for this work.

Woodpeckers: Fanny Hardy Eckstrom. Square, 12mo.; cloth, $1.00; Houghton, Mifflin & Co. A comprehensive account of this interesting family of birds, with five colored plates by Louis Agassiz Fuertes and drawings by John L. Ridgway.

Journey to Nature: J. P. Mowbray. Crown, 8vo, cloth, $1.50; William Briggs.

Making of a Country Home: J. P. Mowbray. $1.50; William Briggs.

XIV. GREEK.

Dictionaries.

Harper's Classical Dictionary: A large dictionary, giving brief description and explanations of subjects connected with classical antiquity.

A Dictionary of Classical Antiquities, Mythology, Religion, Literature and Art: Nettleship and Sandys. 3d ed. London, 1895.

Dictionary of Greek and Roman Antiquities: Smith, Wayte and Marindin. 3d ed. 2 vols. London, 1890-91.

Greek Grammar.

Goodwin's Greek Grammar: Ginn & Co.

History.

Grote: The best history in several volumes for reference.

Bury: Macmillan Co. Perhaps the best one-volume history for reference.

Botsford: Macmillan Co. For high school classes.

The Life of the Ancient Greeks: Gulick. D. Appleton & Co., 1902. A most excellent work. Gives a good bibliography of works suitable for work in Greek.

A Survey of Greek Civilization: J. P. Mahaffy. Meadville, Pa., 1896.

Social Life in Greece from Homer to Menander: J. P. Mahaffy. 3rd ed. London, 1875.

Greek Life and Thought, from Alexander to the Roman Conquest: J. P. Mahaffy. London, 1896.

History of Greece: Abbott. Encyclopædia Britannica. See various articles. Johnson's Universal Encyclopædia. See various articles.

Greece, a Hand-Book for Travelers: Baedecker. England, 2nd ed., 1893.

Old Greek Education: J. P. Mahaffy. New York, 1882.

Homer.

Introduction to Homer: Jebb. Ginn & Co. Should be read by all students in connection with their reading of the Iliad and Odyssey.

Autenrieth's Homeric Dictionary: Harper & Bros. A dictionary for rapid reading of Homer.

Greek Art.

History of Greek Art: Tarbell. Macmillan Co. This book gives a brief but good account of Greek sculpture, architecture, etc.

Composition.

Beginner's Greek Composition: Based mainly upon Xenophon's Anabasis. Book I by W. C. Collar and M. G. Daniell. Illustrated, 90c; Ginn & Co. Useful as a supplement to the Beginner's Greek Book.

Greek Prose: Fletcher and Nicholson. $1.00; The Copp, Clark Co.

First Greek Writer: A. Sedgwick of Oxford. Crown 8vo, 3s 6d; Longmans, Green & Co.

Introduction to Greek Prose Composition: With exercises. By A. Sedgwick, 5s; Longmans, Green & Co. Very valuable.

Lectures on Greek Prose Composition: With exercises. By A. Sedgwick. 4s 6d; Longmans, Green & Co.

Greek Prose Composition: North and Hillard. 3s 6d; Rivington's.

Introduction to Greek Prose Composition: H. Pitman. 2s 6d; Macmillan Co.

Easy Exercises in Greek Accidence: H. G. Underhill. 2s; Macmillan Co.

Easy Exercises in First Greek Syntax: G. H. Nall. 2s 6d; Macmillan Co.

Second Greek Exercise Book: W. A. Heard. 2s 6d; Macmillan Co.

Greek Prose Phrase Book: Based on Thucydides, Xenophon, Demosthenes and Plato. By H. W. Auden. Interleaved, 3s 6d; William Blackwood & Sons.

History of Literature.

History of Ancient Greek Literature: Gilbert Murray. Short Histories of Literature of the World Series, edited by Edmund Gosse. $1.50; W. Heinemann, London.

History of Greek Classical Literature: J. P. Mahaffy. 2 vols. On the poetry and on the prose). $4.00; Harper & Bros.

Greek Life and Thought: From the age of Alexander to the Roman conquest. J. P. Mahaffy. $3.50; Macmillan Co.

Some Aspects of the Greek Genius: S. H. Butcher; $2.50; Macmillan Co. Very valuable.

Studies of the Greek Poets: John A. Symonds. 2 vols., $3.50; Harper & Bros.

Greek Literature: J. B. Jevons. $2.50; Charles Scribner's Sons.

Growth and Influence of Classical Greek Poetry: Prof. Jebb. $1.50; Houghton, Mifflin & Co. Very valuable.

Attic Orators: From Antiphon to Isacos. Prof. Jebb. $5.00; Macmillan Co.

Classical Writers: Edited by John Richard Green. Euripides, Virgil, Tacitus, Sophocles, Livy, Demosthenes. 16mo, each, cloth, 60c, D. Appleton & Co.

Ancient Classics for English Readers: 16mo., cloth, 50c per volume. Homer, The Iliad, The Odyssey, Herodotus, Cæsar, Plautus and Terence, Greek Anthology, Plato, Tacitus, Virgil, Horace, Æschylus, Xenophon, Cicero, Sophocles, Pliny's Letters, Euripides, Juvenal, Aristophanes, Hesiod and Theognis, Lucian, Livy, Ovid, Demosthenes, Catullus, Tibullus and Propertius, Aristotle, Thucydides, Pindar, Lucretius. Also in 9 vols., cloth, per set, $6.75; J. B. Lippincott Co.

Primer of Greek Literature Jebb. American Book Co. An excellent brief history of Greek literature.

From Homer to Theocritus: Capps. Charles Scribner's Sons. This recent book gives a concise but complete survey of Greek literature of the classical period, with selections from English translations.

A History of Ancient Greek Literature: Fowler. D. Appleton & Co., 1901. An excellent work.

Latin and Greek Philology.

Comparative Grammar of Greek and Latin: King and Cookson. $1.40; Clarendon Press.

Short Manual of Comparative Philology for Classical Students: Second edition, revised. P. Giles. 14s; Macmillan Co.

Etymology of Latin and Greek: Charles S. Halsey. $1.12; Ginn & Co.

Short Historical Latin Grammar: W. M. Lindsay. 6s; Clarendon Press. Very valuable.

Short Comparative Grammar of Greek and Latin: Victor Henry. 8s; Swan, Sonnenschein & Co.

Philological Introduction to Greek and Latin: Baur. 6s; Kegan Paul, Trench, Truebner & Co.

Order of Words: Henri Weil. Translated by Super, $1.12; Ginn & Co. Very valuable.

Restored Pronunciation of Greek and Latin: With tables and practical explantations. E. V. Arnoldi, M. A., and R. S. Conway, Litt, D.D., demy 8vo. Second edition, paper covers, 1s; Cambridge University Press.

Antiquities, etc.

Dictionary of Classical Antiquities: Mythology, Religion, Literature and Art. Seyffert. $2.25; Macmillan Co.

Dictionary of Greek and Roman Antiquities: By various writers. Edited by William Smith, LL.D., William Wayte and G. E. Marindin. Third edition, greatly enlarged. Illustrated with nearly 1,000 engravings. 2 vols. Thick 8vo (2,000 pages), $14.00 net, half calf, gilt top, $18.00 net; Little, Brown & Co.

Harper's Dictionary of Classical Literature and Antiquities: Edited by Harry Thurston Peck, M. A., Ph. D., Royal octavo, with over 1,500 illustrations. One vol., cloth, $6.00; two vols., cloth, $7.00; one vol., half leather, $8.00; two vols., half leather, $10.00; American Book Co. Not an alternative to the preceding. Both are indispensable.

Greek and Roman Mythology: Harrington and Tolmon. Students' Series. $1.00; Sanborn & Co. A connected account with literary references.

Dictionary of Greek and Roman Mythology: Dr. William Smith. Revised by various writers. 2 vols., $12.00, half calf, $16.00; Little, Brown & Co.

Mythology and Monuments of Ancient Athens: Harrison and Verral. $4.00; Macmillan Co.

Introduction to Greek Sculpture: Upcott. $1.00; Clarendon Press.

Handbook of Greek Sculpture: E. A. Gardner. $2.50; Macmillan Co.

History of Greek Art: F. B. Tarbell. $1.75, Macmillan Co.; George N. Morang & Co.

Primer of Greek Antiquities: Dr. J. P. Mahaffy. 35c; Macmillan Co.

Social Life in Greece: From Homer to Menander. Dr. J. P. Mahaffy. $2.50; Macmillan Co.

Roman Public Life: A. H. J. Greenidge. $2.50; Macmillan Co.

Life of Greeks and Romans: Guhl and Koner. $2.00; D. Appleton & Co. Very valuable.

Manual of Mythology: Collignon. $3.00; J. B. Lippincott & Co.

Manual of Greek Antiquities: Gardner and Jevons. $4.00; Charles Scribner's Sons. Very valuable.

Roman Life in the Days of Cicero: A. J. Church. 5s; Seeley & Co. Very valuable.

Day in Ancient Rome: Shumway. 75c; D. C. Heath & Co.

Rambles and Studies in Greece: Dr. J. P. Mahaffy. $3.00; Macmillan Co.

Gallus; or Roman Scenes in the Time of Augustus: Becker. Translated by the Rev. F. Metcalfe, B.D. With notes and excursuses, illustrated, crown 8vo, 3s 6d; Longmans, Green & Co.

Charicles; or Illustrations of the Private Life of the Ancient Greeks: With notes and excursuses. Illustrated, crown 8vo, 3s 6d; Longmans, Green & Co.

Companion to School Classics: Dr. James Gow. Illustrated, $1.75; Macmillan Co. A concise, reliable work of reference. Very valuable.

Classical Myths in English Literature: Based chiefly on Bulfinch's Age of Fable. C. M. Gayley. $1.50; Ginn & Co. A good manual of mythology.

Ilios, the City and Country of the Trojans: Including an autobiography of the author. Henry Schliemann. With a preface, appendices and notes by Prof. Rudolf Virchow, Max Müller, etc., xvi, 800 pages, 1,800 illustrations, maps, plans; Royal 8vo, $7.50; half Morocco, $10.00; Harper & Bros.

Troja: Results of the latest researches and discoveries on the site of Homer's Troy, and in the heroic tumuli and other sites. Henry Schliemann. Preface by Prof. A. H. Sayce. xl, 434 pages, 150 wood cuts, maps, 8vo, $5.00, half Morocco, $7.00; Harper & Bros.

Dr. Schliemann's Excavations at Troy, Tiryns, Mycenæ, Orchomenos, Ithaca, Presented in the Light of Recent Knowledge: Dr. Carl Schuchhardt. Translated by Eugenie Sellers, 8vo, 18s net; Macmillan Co.

Remains of Ancient Rome: Middleton. 2 vols., $7.00; Macmillan Co.

Mycenæan Age: Tsountas and Manatt. $6.00; Houghton, Mifflin & Co.

Ancient Rome in the Light of Recent Discoveries: Rodolfo Lànciani. With 36 full-page plates (including several heliotypes) and 64 text illustrations, maps and plans, with slip cover in Italian style, 8vo, gilt top, $6.00, Houghton, Mifflin & Co.; 24s, Macmillan Co. Represents largely the pre-Christianized Rome in its historical, social, religious and other phases.

Pagan and Christian Rome: Lanciani. With 26 full-page illustrations, including plans, facsimilies, etc. With slip-cover in Italian style, 8vo, gilt top, $6.00, Houghton, Mifflin & Co.; 24s, Macmillan Co. Sets forth principally discoveries relating to the period of transition into Christianity under the Cæsars.

Walks in the Country of Virgil and Horace: Gaston Boissier. $2.00; G. P. Putnam's Sons.

Ave Roma Immortalis: Marion Crawford. 2 vols., $6.00; Macmillan Co.

Ruins and Excavations of Ancient Rome: Lanciani. $4.00; Houghton, Mifflin & Co.

General.

Guide to the Choice of Classical Books: Prof. J. B. Mayor. 4s 6d; George Bell & Sons.

List of Books Recommended for a High School Classical Library: By a committee of the Michigan Schoolmasters' Club. Edited by C. L. Maeder. Paper, 10c; Macmillan Co. This list, published in 1895, is a very complete one. The report of the committee may be found in the School Review for June of that year.

XV. LATIN. (1)

Dictionaries, etc.

Harper's Latin Dictionary: C. T. Lewis and C. Short. Harper & Bros, 1891.

Latin-English and English-Latin Dictionary: J. T. White.

Companion to School Classics: J. A. Gow. 3d edition; Macmillan Co., 1893.

Illustrations of School Classics: G. F. Hill. Macmillan Co., 1903.

Harper's Dictionary of Classical Literature and Antiquities: H. T. Peck. Harper & Bros., 1896.

Dictionary of Greek and Roman Antiquity: W. Smith. 2 vols.; Little, Brown & Co., 1890.

Dictionary of Greek and Roman Biography and Mythology: W. Smith. 3 vols.; Little, Brown & Co., 1872.

Dictionary of Greek and Roman Geography: W. Smith. 2 vols.; Little, Brown & Co., 1892.

Atlas of Classical Antiquities: T. Schreiber. Macmillan Co.

Morphology and Syntax.

Manual of Philology: Giles.

Latin Language: W. M. Lindsay. Macmillan Co., 1894.

Grammar of the Latin Language: H. J. Roby. 2 vols.; Macmillan Co.

The Hale-Buck Latin Grammar: W. G. Hale and C. D. Buck. Ginn & Co., 1903. $1.00.

Latin Grammar: B. L. Gildersleeve. Revised by Lodge, 3rd edition, 1894; University Publishing Co.

Latin Grammar: J. H. Allen and J. B. Greenough. Ginn & Co., 1895.

Latin Grammar: Bennett. Allyn & Bacon.

Latin Grammar: A. Harkness. American Book Co.

Roman Pronunciation of Latin: F. E. Lord. Ginn & Co.

Private Life.

The Private Life of the Romans: H. W. Johnson. 1903; Scott, Foresman & Co., Chicago.

(1) For an essential section see addendum.

Gallus, or Roman Scenes in the Time of Augustus: W. A. Becker. 1888; Longmans, Green & Co.

Pompeii, Its Life and Art: A. Mau. Translated by Kelsey. 1899; Macmillan Co.

Life of the Greeks and Romans Described from Antique Monuments: E. Guhl and W. Koner. D. Appleton & Co.

Roman Antiquities: A. S. Wilkins.

Private Life of the Romans: H. W. Preston and L. Dodge. 1893; Sanborn.

Society in Rome Under the Cæsars: W. R. Inge.

Mythology and Religion.

(For Mythology see Department of Greek Religion.)

Roman Festivals: Warde Fowler.

Religion und Cultus der Römer: Wissowa. Munich, 1902.

Classic Myths in English Literature: C. M. Gayley.

Geography.

Atlas Antiquus: Kiepert. Sanborn, Boston.

Classical Geography: H. F. Tozer. (Literature Primer Series); American Book Co.

Archæology.

Ruins and Excavations of Ancient Rome: Lanciani. Houghton, Mifflin & Co.

Remains of Ancient Rome: Middleton. London, 1892.

Text-book of the History of Sculpture: A. Marquand and A. L. Frothingham. 1896; Longmans, Green & Co.

Roman Art: Wickhoff. Macmillan Co.

Text-book of the History of Architecture: A. D. F. Hamlin. 1896; Longmans, Green & Co.

History of Latin Literature.

History of Roman Literature: J. W. Mackail.

History of Roman Literature: W. S. Teuffel. Translated by Warr. 2 vols., 1891; Macmillan Co.

History of Roman Literature: Cruttwell.

Roman Poets of the Augustan Age, Virgil: W. Y. Sellar. Second edition, 1883; Macmillan Co.

Ancient Lives of Virgil, with an essay on the Poems of Virgil in Connection with His Life and Times: H. Nettleship. 1879; Macmillan Co.

History of Latin Literature: Simcox. 2 vols.; Harper & Bros.

Roman History and Institutions.

(See also the Department of History.)

Roman Political Institutions: Abbot. 1901; Ginn & Co.

Roman Public Life: Greenidge. 1901; Macmillan Co.

A History of Rome: Botsford. 1901; Macmillan Co.
History of Rome: Mommsen. 5 vols.; Charles Scribner's Sons.
Outlines of Roman History: Pelham. New York, 1893.
Decline of the Roman Republic: Long. 5 vols.; George Bell & Sons.
History of Rome: How and Leigh. Longmans, Green & Co.
History of the Romans Under the Empire: Merivale. D. Appleton & Co.
Student's Roman Empire: Bury. 27 B. C.—170 A. D.; Harper & Bros., 1903.
Provinces of the Roman Empire: Mommsen. Translation by W. P. Dickson, 1886; Charles Scribner's Sons.

ROMANCE LANGUAGES.—XVI. FRENCH.

Grammars.

Whitney's: The oldest and best of French Grammars, based on scientific principles.
Bevier's: A recent work, in every way a worthy successor to Whitney.
Fraser and Squair's: A combination Grammar and Reader, very satisfactory for beginners.
A First Book in French: Downer. D. Appleton & Co., 1902.

Phonetics.

Matzke's Primer of French Pronunciation: A simple and practical work for laying the foundation of a correct pronunciation.
Koschwitz's Parlers Parisiens: Specimens of French pronunciation by famous Parisians. A good book of reference for teachers.

Histories of Literature.

Kaskier and Atkins (in English): Excellent.
Duval's (in French).

Dictionaries.

Elwell's. Heath's. Gasc's.

XVII. SPANISH.

Grammars.

Ramsey's Text-book of Modern Spanish: The best Spanish Grammar.
Short edition of preceding, practically as good.
Edgrere's: A small book in fifteen lessons. Satisfactory for beginners.

Readers.

Ramsey's: Well adapted for beginners.
A First Spanish Book and Reader: Giese. D. Appleton & Co., 1902.
Matzke's: Too difficult for beginners, but suitable for a second reader.
Ford's Anthology: Selections from Spanish literature beginning with the Fourteenth Century, for advanced classes.

Histories of Literature.

Clarke's: Short and practical.
Fichuir's: Oldest and most famous of works in English.

XVIII. ITALIAN.

Grammars.

Grandgent's.

Readers.

Boneu's.

Dictionary.

Millhouse.

XIX. GERMAN.

Texts and Reference Books.

German Grammar: Calvin Thomas. $1.50; Henry Holt & Co.
Life and Works of Schiller: Calvin Thomas.
German Dictionary: Whitney. $1.50; Henry Holt & Co. Cheap and good.
Studies in German Literature: Bayard Taylor. $2.00; G. P. Putnam's Sons.
Hours with German Classics: Frederic H. Hedge. $2.00; Little, Brown & Co.
Poems from Heine: White. 75c; D. C. Heath & Co. Simple poems well arranged.
Poems from Uhland: W. T. Hewett. $1.10; Macmillan Co. Good ballads.
Balladenbuch: Leipsic, $2.00. Illustrations fine.
Commercial German: Kutner. American Book Co., 1903. Very excellent.
A German Reader: Jones. D. Appleton & Co., 1901.
History of Germany: Lewis. Harper & Bros. Accurate.
The Three Germanys: Fay. 2 vols., $6.00; Walker. Pleasant reading.
Life of Goethe: Lewes. $1.50; Houghton, Mifflin & Co. Interesting to all.
History of Germany: Henderson. 2 vols., $5.00; Macmillan Co.
Studien und Plaudereien: Sauveur. Series I and II, $1.75 each; Henry Holt & Co. Easy reading in German.
Grimm, Maerchen: 65c; D. C. Heath & Co. Elementary.
Andersen, Maerchen: 70c; D. C. Heath & Co. Elementary.
Schiller Gallerie: From drawings illustrating works of Schiller.
Goethe Gallerie: From drawings illustrating works of Goethe.
Frau Sorge: Sudermann: $1.00; Henry Holt & Co. One of the best recent stories.
German Dictionary: Muret-Sauders. $4.00; Stechert. Very recent.
Eine Frage: George Ebers. 50c; Henry Holt & Co. Story.
Life of Frederic the Great: $1.50; G. P. Putnam's Sons. (Heroes of the Nations.

History of Literature.

Outlines of German Literature: Gostwick and Harrison. New York, $2.00; Henry Holt & Co.

History of German Literature: Kuno Francke. New York, $2.50; Henry Holt & Co.

History of German Literature: W. Scherer. Edited by Max Müller. Translated by Mrs. F. C. Conybeare. 2 vols., $4.50; Charles Scribner's Sons.

Geschichte der Deutschen National-Literatur: H. Kluge. Mk. 25. Bondi, Altenberg, This is the best short history.

Deutsche Literaturgeschichte: R. König. 2 vols., Mk. 20; Velhagen und Klasing, Leipzig. A good, popular work, with numerous illustrations, portraits, etc. Includes the literature up to the present day.

Geschichte der Deutschen Literatur von Leibnitz bis auf unsere Zeit: Julian Schmidt. 5 vols., Mk. 42, cloth; W. Hertz, Berlin. This is the standard work for the period it covers. Ends with year 1866.

Literaturgeschichte des 18. Jahrhunderts: H. Hettner. 3 vols. in 6, Mk. 55; Vieweg, Braunschweig. A most excellent work. Vol. III treats of German literature, vols. I and II of English and French respectively.

Hauptstroemungen der Literatur des 19. Jahrhunderts: G. Brandes. 5 vols., Mk. 25; Barsdorf, Leipzig. A brilliant and inspiring work, dealing with general European literature in the Nineteenth Century. An English edition is now (1901) being published by Macmillan Co. The titles of the six volumes are: "The Emigrant Literature," "The Romantic School in Germany," "The Reaction in France," "Naturalism in England," "The Romantic School in France," "Young Germany."

Die Deutsche Literatur des 19. Jahrhunderts: R. M. Meyer. Mk. 12.50; Bondi, Berlin, 1900. Excellent reference work. 1 vol. of 966 pages. Brings the history right up to the present day.

Die geistigen und socialen Stroemungen des 19. Jahrhunderts: Th. Ziegler. Mk. 12.50; Bondi, Berlin. Good account of intellectual and social development of Germany in Nineteenth Century, including the literature. 1 vol. of 714 pages.

Geschichte des Deutschen Volkes: Th. Lindner. Mk. 12; Cotta, Stuttgart. Excellent recent short political history, with brief reviews of literary and social development.

Short History of German Literature: Hosmer. $2.00; Charles Scribner's Sons.

XX. COMMERCIAL.

Bookkeeping and Commercial Law.

The Canadian Accountant: Edited and published by Robinson and Johnson. $2.00. A good work on elementary and intermediate bookkeeping, banking, office practice, business papers and correspondence.

Goodwin's Improved Bookkeeping and Business Manual: Edited and published by J. H. Goodwin. $3.00 Treats of bookkeeping under a large number of separate headings, or in detached articles; these articles are concise, clear and instructive. It is elementary and intermediate in character.

Manual for Accountants: Edited and published by W. C. Eddis. $3.00. In the form of questions and answers and final bookkeeping of the Chartered Accountants' examinations of 1897 and 1898.

Bookkeeping for Accountant Students: Lawrence R. Dicksee. $3.00; Gee & Co. Elementary and intermediate bookkeeping with examples in English currency.

Partnership Accounts: Percy Childs. $1.00; Gee & Co. An intermediate and advanced work with problems in partnership worked out.

Bookkeeping and Other Papers: Gerard Van de Linde. $2.75; Blades, East & Blades. An advanced work.

Executorship Accounts: Whitney. $1.75; Gee & Co. A series of lectures on executorship, together with a complete set of accounts.

Riker's Forty Rules for Locating Errors in Trial Balances: Edited and published by H. E. Riker. 25c.

Keister's Corporation Accounting and Auditing: D. A. Keister. $4.00; The Burrows Bros. Co. This is an advanced work—a practical treatise on higher accounting.

Soule's New Science and Practice of Accounts: Edited and published by George Soule & Sons. $4.00. An advanced work on joint stock company bookkeeping and expert accounting.

Auditing: Lawrence R. Dicksee. $6.00; Gee & Co. An advanced work on auditing and all that pertains thereto.

Laws of Business: Edited and published by C. A. Fleming. $1.50. It contains the forms of business and legal documents, and leading principles of law as it relates to business.

Commercial Law and Business Forms: Edited and published by C. A. Fleming. $1.00. An abridged edition of Laws of Business, suitable for class work.

Business Educator's Commercial Law: T. H. Luscombe. $2.00; The Business Educator's Publishing Co. A compilation of the general principles applicable to mercantile law.

Promissory Notes, Drafts and Cheques: J. W. Johnson. 75c; Robinson & Johnson. Conveys in a clear, concise way a knowledge of notes, drafts, foreign bills of exchange, and cheques; and also deals with bookkeeping in connection therewith.

Accountants' Compendium: Sidney Stanley Dawson. $5.00; Gee & Co. A lexicon containing a digest of the subjects, phrases, terms and words which meet the business man and the accountant.

Accountants' Manual: Vols. I-VI at $4.00 per vol.; Gee & Co. Contains the questions and answers of the English Chartered Accountants' Institute examination. Vol. I contains the questions and answers from December,

1884, to June, 1887. The other volumes apply respectively to the following dates: December, 1887, to June, 1890, 1890 to 1892, 1892 to 1894, 1894 to 1896, 1896 to 1898. Succeeding volumes are issued every other year. These volumes contain a valuable fund of information relative to the practice and laws of accountancy.

Shorthand.

Phonographic Teacher: 20c.

Manual of Phonography: 50c.

Phonographic Reporter: 60c.

Pitman's Shorthand Instructor: (Manual and Reporter). Cloth, $1.50.

Phonographic Phrase Book: 35c. Contains 2,000 phrases and 43 pages of exercises.

Phonographic Dictionary: Cloth, $1.50. Contains 55,000 words and 5,000 proper names.

Abridged Shorthand Dictionary: 85c. Contains 2,200 words.

Exercises in Phonography: 5c. Exercises in longhand suitable for class dictation in connection with the "Teacher."

Shorthand Gradus: 6c. Exercises in longhand suitable for class dictation in connection with the "Manual."

Self Culture: 35c. Printed in corresponding style without key.

Business Correspondence in Shorthand, No. 1: 30c. Business letters in reporting style with key.

Business Correspondence in Shorthand, No. 2: 30c. Business letters in reporting style with key.

Typewriting.

Barnes' Complete Typewriting Instructor, Special Typewriting Instructor and Abridged Typewriting Instructor: Arthur J. Barnes. $1.50, $1.10, 50c, respectively.

The last two of the above-named instructors are abridgments of the first. All are adapted to touch typewriting, but may be used otherwise. The first two are put up in different editions—Remington edition, Smith-Premier edition, etc., each edition differing only in having a chapter on the mechanism of its own machine. The exercises in all may be used with any standard keyboard machine. Either of the last two is suitable for class work. They contain 200 pages, 100 pages, and 56 pages, respectively.

Van Sant System of Touch Typewriting: A. C. Van Sant. 50c; Powers & Lyons. Consists of 15 cards, about 7 in. by 11 in., of instructions, lessons and exercises.

Complete Touch Typewriting Instructor: F. W. Mosher. $1.00; Powers & Lyons. Contains 86 pages of instructions, lessons and exercises. It opens from the bottom upward like a reporter's notebook.

Drawing and Art.

Elementary Drawing Simplified: D. R. Augsburg. 75c; Educational Publishing Co. A teacher's handbook for primary drawing. It treats of the sphere, the cube, the cylinder and modifications and applications of these.

Drawing Simplified: D. R. Augsburg. $1.00; Educational Publishing Co. Divided into: I. The cube and its applications. II. The cylinder and its applications. II. The triangular prism and its applications. VI. Light, shade, shadow and reflection.

Prang Elementary Course in Art Instruction: Prang Educational Co. Eight teacher's manuals at 75c each. This comprises an eight years' course—from primary to more advanced work. It covers the three general subject divisions—representation, decoration and construction, and in connection with these, treats of light-and-shade, light-and-dark, and color. It develops these divisions along educational, industrial, and artistic lines.

Model and Object Manual: Langdon S. Thompson. 35c; D. C. Heath & Co. Treats of the sphere, the cylinder, the cone, and modifications of these; also of straight lines, plain surfaces and rectilinear solids.

Lessons in Pencil Sketching from Nature: Bartholomew. Three manuals with 12 plates each, 75c each; Prang Educational Co. Primary and advanced work.

Light and Shade: Cross. $1.00; Ginn & Co. A primary and advanced work.

Color Study: Cross. 60c; Ginn & Co. Primary and advanced work.

Course in Water Color. 75c; Prang Educational Co. Covering the work of eight years of school grades.

Suggestions for Instruction in Color. $1.00; Prang Educational Co. Primary and advanced work.

Æsthetic Manual: Langdon S. Thompson. 60c; D. C. Heath & Co. A treatise on decorative design.

Mechanical Manual: Langdon S. Thompson. 75c; D. C. Heath & Co. A treatise on practical plane geometry, projection and prospective (parallel, angular and oblique.).

School of Art Perspective: Andrews. 3s 6d; George Gill & Sons. On parallel and angular perspective.

Third Grade Perspective. Part I: H. J. Dennis. 7s. 6d.;Chapman & Hall. On angular and oblique perspective.

Complete Perspective Course: Humphrey Spanton. $1.25; Macmillan Co. A work on elementary and advanced perspective, together with the projection of shadows and reflections.

New School of Art Geometry: 1s; George Gill & Sons. Contains solutions for 458 problems in practical plane geometry, projection and graphic arithmetic.

Machine Drawing: Gardner C. Anthony. $1.50; D. C. Heath & Co. Contains the principles of machine drawing, sketching, figuring, etc., with numerous practical examples.

Mechanical Drawing, Self Taught: 8vo, 14 plates, 303 pages, 330 illustrations, $4.00; Munn & Co. The author begins with the drawing board and the use of instruments; then comes a system of studies, lines and curves; shadow lines and line shading are successively given. These are followed by the arrangement of various views, the drawing of bolts, nuts, screws, threads and spirals, followed in turn by projections, the drawing of gear wheels and plotting of mechanical motion, and followed by numerous special examples in general machine and engine work. The work is splendidly illustrated.

Decorative Design: An elementary text-book of principles and practice: Frank G. Jackson, Lecturer on Principles of Ornament and Teacher of Technical Art Processes in the Birmingham School of Art. Illustrated, 3d ed., large crown 8vo, 7s 6d. Assists young students in their early decorative attempts by showing them the constructive origin of ornamentation, and places before them guiding principles and ordinary methods.

Theory and Practice of Design: An advanced text-book on decorative art, being a sequel to the author's "Lessons on Decorative Design." Frank G. Jackson. Illustrated, large crown 8vo, 9s. A continuation of the book on decorative design, and is intended to help advanced students.

A Short History of Architecture: By the late A. L. Tuckerman. 8vo, 167 pages, 26 plates, $1.50; Munn & Co.

History of Architecture in All Countries: J. Fergusson. 2 large 8vo roan vols., 1,015 pages, $7.50; Munn & Co. A work indispensable to all architectural students.

Architectural Drawing: Practical lessons in: W. B. Tuthill. Oblong, 4to, 31 illustrations, 33 plates, 7th ed., $2.50; Munn & Co. The illustrations in the text show how to make the working drawings and write the specifications for buildings. The work shows not only the construction, but also the manner of representation. A very valuable work for all students of architectural drawing.

Building, Construction and Superintendence: F. E. Kidder. 2 vols., $4.00 each; Wm. T. Comstock, 23 Warren St. Part I is on masons' work. Part II is on carpenters' work. Both are well illustrated, and describe minutely materials to be used and methods of construction.

Freehand Lettering: Frank T. Daniels. 75c; D. C. Heath & Co. Contains eleven chapters: Preliminary exercises, forms of Gothic letters, spacing of letters, construction of titles, lower case letters, slant letters, inking, Roman letters and figures, Old English and German text, miscellaneous styles, ornamentation.

Alphabets, Plain and Fancy: F. S. Copely. Oblong, 4to., 47 plates, $2.00; Munn & Co. Treats of Egyptian, block, Roman, italic, Old English, German text, Tuscan, pearl, velvet, text hand, Italian, engrossing, Gothic, ancient Greek, Hebrew, ciphers, monograms, flourishes, titles, compass points, borders, etc. A splendid work.

Outlines of History of Art: Wilhelm Luebke. $4.50; Dodd, Mead & Co.

Art for Art's Sake: John C. Vandyke. Seven university lectures on the technical beauties of painting. $1.50; Charles Scribner's Sons.

How to Judge of a Picture: John C. Vandyke. Familiar talks in the gallery with uncritical lovers of art. 75c; Eaton & Mains, New York.

Riverside Art Series: Paper, 35c; cloth, 50c; Houghton, Mifflin & Co. Ten vols. (100 pages each), published to January. Each has 16 full-page reproductions of characteristic works of ancient painters—Raphael, Titian, etc.—with explanatory and introductory text. Will stimulate the production of good taste in our schools.

XXI. PHYSICAL EDUCATION.

Book of College Sports: By Walter Camp. Illustrated, $1.75; Century Co. Describes baseball, football, track athletics and rowing. An excellent authority on sports.

School Gymnastics: By Jessie H. Bancroft. Free hand. School gymnastics, with light apparatus; D. C. Heath & Co., 1901. Miss Bancroft has done excellent work in these volumes. Neither the Swedish nor the German systems has been slavishly adopted, but the characteristics of these systems suitable for our American schools have been utilized. The publishers have issued the books in perfect form.

All England Series of Handbooks of Athletic Games: 32 vols., 1s each; Geo. Bell & Sons. The series deals with the following topics: Baseball, boxing, broadsword and single-stick, cricket, dumb bells, fencing, football, golf, gymnastics, tennis, Indian clubs, wrestling, sailing, etc.

Physical Exercise in Public Schools: An artistic system of exercises, including the Delsartean principles of execution and expression. By R. Anna Morris, supervisor of physical culture, Cleveland public schools. Illustrated, $1.00; American Book Co.

How to Get Strong and How to Remain So: By William Blaikie. New edition, $1.00; Harper & Bros. A system of exercises for the development of all classes of muscles, with advice for daily exercise.

Elements of Physical Education: A Teachers' Manual. By D. Lennox, M. D., medical director of Dundee Public Gymnasium and instructor to the University of St. Andrew's, 4s; William Blackwood & Sons. Part I contains the essentials of what is known with regard to the physiology and psychology of muscular exercises. In Part II illustrations are given of the principles with drills arranged in a consecutive and progressive series. Part III gives original musical accompaniments to the drill by H. E. Losby. This is an excellent work for the teacher.

Artistic Work: By H. S. Anderson of Yale University Gymnasium. Illustrated, 75c.

Muscular Exercise for Health: Lydia J. Mewcomb. Illustrated, 75c; Edgar S. Werner Pub. & Supply Co. Concise and practical drills by Genevieve Stebbins, containing, 1. Eastern Temple Drill. 2. Energizing Dramatic

Drill. 3. Munich Fan Drill. 4. An Æsthetic Fan Drill, 30c; Edgar S. Werner Pub. & Supply Co.

Scarf Fantastics: A twenty-minute æsthetic drill. By Elizabeth Middleton. 25c; Edgar S. Werner Pub. & Supply Co.

Society Gymnastics and Voice Culture: By Genevieve Stebbins. $1.00; Edgar S. Werner Pub. & Supply Co. Especially for class use.

System of Physical Training: By Genevieve Stebbins. $1.00; Edgar S. Werner Pub. & Supply Co.

Gesture and Pantomimic Action: By Florence Adams. $2.50; Edgar S. Werner Pub. & Supply Co.

Wordless Poems: By Mary T. Magill. $1.25; Edgar S. Werner Pub. & Supply Co.

Girl's Physical Training: Being a series of healthy and artistic movements to music. By Alice R. James. With numerous illustrations, $1.75; Macmillan Co.

Manual of Physical Measurement for Young Men: Adopted by the American Association for the Advancement of Physical Education. By Dr. Edward Hitchcock and Dr. H. H. Seelye of Amherst College. Paper, 30c; D. C. Heath & Co. These directions, while prepared especially for Amherst students, will be of value to any well equipped gymnasium, and will be of special interest to instructors.

How to Swim: A practical treatise upon the art of navigation, together with the best methods of saving persons imperiled in the water and of resuscitating those apparently drowned. With 31 illustrations. By Captain Davis, inspector of the U. S. Volunteer Life-saving Corps. $1.00; G. P. Putnam's Sons.

Theory of Physical Education: By Thomas Cheslerton. 2s 6d; Gale & Polden, London.

Strength and How to Obtain It: Sandow. Gale & Polden, London.

Free Gymnastics: By Major S. J. Noakes. 1s 6d; Gale & Polden, London.

Modern Gymnastic Exercises: Parts I and II. A. Alexander. 7s 6d; Geo. Phillip & Son, 32 Fleet St., London, Eng.

Physical Education: By Maclaren. 8s; Clarendon Press.

Art of Breathing: By Surgeon Captain Hoper Dixon, A. M. S. 2s 6d; Gale & Polden, London.

Calisthenic Training and Musical Drill: By Cruden. 50c; Dick & Fitzgerald, New York.

Book of Drills and Marches for Young People: By Wilson. 50c; Dick & Fitzgerald, New York.

Art of Gymnastics: By Dick. $1.00; Dick & Fitzgerald, New York.

Dumb Bell and Indian Club Exercises: By Dick. 25c; Dick & Fitzgerald, New York.

Calisthenics and Musical Drill for Children: By Alexander. 25c; Dick & Fitzgerald, New York.

American Physical Education Review, New York.

XXII. DOMESTIC SCIENCE AND ART.

Domestic Science.

Elements of the Theory of Cooking: Williams and Fisher. $1.00; Macmillan Co.

Boston School Kitchen Text-Book: Lincoln. $1.00; Little, Brown & Co.

Chemistry and Nutritive Value of Food.

United States Bulletins: Nos. 13, 17, 23, 28, 34, 35, 43, 48, 50, 45, 67, 63, 74, 85, 93, 112, 121, 128. These can be had only through the courtesy of the U. S. Agricultural Department. Address Mr. A. C. True, Washington, D. C.

Chemistry and Economy of Food: Atwater.

Food: Church. $1.00; Chapman & Hall.

Chemistry of Cooking: Williams. $1.25; D. Appleton & Co.

Food from the Dietetic Standpoint.

Dietetic Value of Bread: Goodfellow.

Practical Dietetics: Gilman Thompson. $5.00; D. Appleton & Co.

Subjects Connected with Domestic Science.

Food Materials and Their Adulteration: Richards. $1.00; Home Science Pub. Co.

Handbook of Sanitary Information: Tracy. 50c; D. Appleton & Co.

Dust and Its Dangers: Story of the bacteria, drinking water and ice supplies. Pruddem. 60c each; G. P. Putnam's Sons.

Germ Life: Conn. 40c; D. Appleton & Co.

Story of the Living Machine: Conn. 40c; D. Appleton & Co.

Chemistry in Daily Life: Lasser Cohn. 40c; D. Appleton & Co.

Text-Book of Anatomy and Physiology: Kimber. $3.00; Macmillan Co.

How to Feed Children: Hogan. $1.00; J. B. Lippincott & Co.

Household Management.

Home Economics: Parloa. 20c; Century Co.

Cost of Living: Richards. $1.00; John Wylie & Co.

Cost of Food: Richards. $1.00; John Wylie & Co.

Making of the Home: Barnett. 50c; Cassell & Co.

Expert Waitress: By Annie F. Springsteed. 75c; Harper & Bros.

Cook Books, Containing Also the Theory.

Young Housekeeper: Parloa. $1.20; Estes & Lauriat, Boston.

Mrs. Seeley's Cook Book: Cloth, $2.00; half leather, $3.00; Macmillan Co.

Boston Cook Book: Mrs. Lincoln. $2.00; Roberts Bros., Boston.

Principles of Practical Cookery: Mann. 40c; Longmans, Green & Co.

Cook Books, Containing Recipes Only.

Mrs. Rorer's Cook Book: At various prices.

Boston Cooking School Cook Book: F. W. Farmer. $1.50.

How to Cook for the Sick: Sachse. $1.00; J. B. Lippincott & Co.

Cold Dishes for Hot Weather: Ysaguirre and La Marcia. $1.00; Harper & Bros.

Textiles.

Textiles: William Morris. $2.50; Charles Scribner's Sons.

Textile Fabrics: Rock. 2s 6d; Chapman & Hall.

Design in Textile Fabrics: 4s 6d; Cassell & Co.

Cotton Spinning: Marsden. 6s 6d; George Bell & Sons.

Cotton Fibre: Hugh Monie. 15c; Haywood, Manchester.

Pamphlet on Cotton: Willimantic Linen Co., Willimantic, Conn.

Theory and Practice of Jute Spinning and Weaving: Leggatt. 10s 6d.

Silk Goods of America: Wychoff. $1.00; American Silk Association, N. Y.

Early History of English Woolen Industry: Ashley. 75c; American Economic Association.

Woolen and Worsted Manufacture: Beaumont. 7s 6d; George Bell & Sons.

Wool-Producing Animals: 7s 6d; Chapman & Hall.

Dyeing of Textile Fabrics: Hummel. 5s; Cassell & Co.

Fibres.

Descriptive Catalogue of Useful Fibre Plants of the World: U. S. Department of Agriculture; Department of Fibre Investigation, Washington, D. C.

Cotton Plant: U. S. Agricultural Department, Bulletin 33.

Farmers' Bulletin No. 27: U. S. Agricultural Department.

Miscellaneous.

History of Inventions, Discoveries, and Origins: Beckman. 3s 6d; George Bell & Sons.

Origin of Inventions: By Otis T. Mason. Charles Scribner's Sons.

Stories of Invention: C. E. Hale. $1.00; Roberts.

Systematic Cutting Out: E. Carlisle. 2s; Hatchard, London.

School Needlework: Teachers' Edition. O. C. Hapgood. 75c; Ginn & Co.

Sewing Course: Without models. Woolman. $3.50; Teachers' College, New York.

Color: M. E. Chevruel. 3s 6d; George Routledge & Sons.

Industrial Biographies: Smiles.

XXIII. MANUAL TRAINING.

Most of the following works deal with the subject from the point of view of general culture and broad educational ends, and are well worth every teacher's attention.

Many practical manuals have been published. A bibliography of the best of these has been issued by the Eastern Teachers' Manual Training Association, Secretary Clifford B. Connolly, Page and Manhattan streets, Allegheny, Pennsylvania.

For the details of good courses of study, see the prospectuses of the leading Manual Training High Schools of the United States, especially that of the Boston Mechanic Arts' High School, which gives the manual training exercises in full, and the Manual Training High School, Providence, which provides a more comprehensive technical course.

School and Society: By Prof. John Dewey. $1.00, University of Chicago Press; $1.00, McClure, Phillips & Co.

Growth of the Brain: By Donaldson. $1.50; Charles Scribner's Sons.

Mind and Hand: By Charles H. Ham. $1.25; American Book Co.

Talks on Pedagogics and Talks on Teaching: By Col. Parker. E. L. Kellogg & Co.

Technical Art Education in Public Schools: Felix Adler.

Constructive Work in the Elementary Schools: G. E. English.

Modifications of Secondary School Courses Most Demanded by the Conditions of To-day: C. Y. Keyes.

Function of Manual Training in the Elementary School: Richard Waterman.

The preceding four books are published by the National Educational Association.

Educational Value of Manual Training in Public Schools: Felix Adler. New England Conference of Educational Workers, J. O. Norris, secretary, Melrose, Mass.

Theory of Educational Sloyd: By Otto Solomon. $1.25; Silver, Burdette & Co.

Sloyd, in the Service of the School: Educational Monographs. Vol. I, No. 6. New York.

Industrial Instruction: A Pedagogic and Social Necessity. By Robert Seidel. $1.25; D. C. Heath & Co.

Manual Training School; Its Aims, Methods and Results: By C. M. Woodward, director of the Manual Training School, Washington University, St. Louis. 62c, D. C. Heath & Co.; 3s 6d, Walter Scott. This work is the traditional classic in the United States, but is somewhat out of date as to practice.

New Education: By Richard Wake. 10s, or in three parts, 3s 6d each; Chapman & Hall. An excellent work on method. Contains descriptive lessons on wood, tools and bench work. Very useful to the teacher.

Education in Its Relations to Manual Industry: By MacArthur. D. Appleton & Co. An excellent work.

New Methods in Education: By Tadd. Orange Judd & Co.

XXIV. EDUCATION AND PEDAGOGY.

Great Educators' Series; Nicholas Murray Butler, editor. 11 vols. already issued; others in preparation. $1.00 per vol.; Charles Scribner's Sons.

Biographies of Aristotle, Horace Mann, etc., with accounts of great educational movements with which these were associated.

International Educational Series: Dr. W. T. Harris, editor. About 50 vols. already issued; others in preparation. $1.00; Kegan Paul, Trench, Truebner & Co.; $2.00 per vol., D. Appleton & Co. Education treated from historical, critical, theoretical and practical standpoints.

Heath's Pedagogical Library: About 30 vols. already issued; others in preparation; D. C. Heath & Co. History, theory and methods of teaching.

American Teacher's Series: James E. Russell, editor. Several volumes in preparation; some issued; Longmans, Green & Co. Theory and methods in various subjects for teachers in elementary and secondary schools.

Cyclopedia of Education: Alphabetical reference handbook. Fletcher, editor. 500 pp.; Swan, Sonnenschein & Co.

Historical Survey of Pre-Christian Education: S. S. Laurie. Longmans, Green & Co. Accounts of the educational ideas of Arabs, Babylonians, Assyrians, Hebrews, Chinese, Hindoos, Persians, Greeks, Romans, etc.

Introduction to the History of Educational Theories: Oscar Browning. Harper & Bros., 50c; W. J. Gage & Co.

History of Pedagogy: (From French standpoint). Gabriel Compayre. Translated by W. H. Payne; D. C. Heath & Co.

History of Education: F. V. N. Painter. D. Appleton & Co.

Aristotle and Ancient Educational Ideals: Thomas Davidson. Great Educators' Series; Charles Scribner's Sons.

Education of the Greek People and Its Influence on Civilization: Thomas Davidson. International Educational Series; D. Appleton & Co., New York.

Old Greek Education: By J. P. Mahaffy. 90c; The Copp, Clark Co.

Rise and Early Constitution of Universities: Prof. S. S. Laurie. D. Appleton & Co.

Herbart and the Herbartians: Prof. De Garmo. Great Educators' Series; Charles Scribner's Sons.

The Arnolds: J. G. Fitch. Great Educators' Series; Charles Scribner's Sons.

German Universities: Prof. Paulsen. Translated by Perry; Macmillan Co.

Educational Reformers: R. H. Quick. International Educational Series; D. Appleton & Co.

History of the School System of Ontario: G. W. Ross. International Educational Series; D. Appleton & Co.

Froebel's Laws for All Teachers: By James L. Hughes. International Educational Series; D. Appleton & Co.

Comenius, His Life and Educational Works: S. S. Laurie. Small, Boston.

Cousin, Victor: By Jules Simon. Trans., Anderson; McClurg, Chicago.

Horace Mann: Prof. A. B. Hinsdale. Great Educators' Series; Charles Scribner's Sons.

Pestalozzi, His Life and Work: By Roger de Guimps. Trans. by Russell. International Educational Series; D. Appleton & Co.

Rousseau: Thomas Davidson. Great Educators' Series; Charles Scribner's Sons.

German Higher Schools: The history, organization and methods of secondary education in Germany. Dr. James E. Russell, Columbia University. $2.25; Longmans, Green & Co.

Studies in Secondary Education: Ackland and Smith, editors. Percival, London.

Psychology Applied to Education: Gabriel Campayre. Trans. by Payne; D. C. Heath & Co.

Psychologic Foundations of Education: Dr. W. T. Harris. International Educational Series; D. Appleton & Co.

Apperception; A Monograph on Psychology and Education: Karl Lange, Trans. by De Garmo; D. C. Heath & Co.

Institutes of Education: Comprising an introduction to rational psychology. S. S. Laurie. Macmillan Co.

Psychology: (Briefer course). William James. $1.50; Henry Holt & Co.

Talks to Teachers on Psychology: William James. $1.50; Henry Holt & Co.

Lectures on Human and Animal Psychology: William Wumdt. Trans. by Creighton and Titchener. $2.60; Macmillan Co.

Psychology of Childhood: Frederick Tracy. Last edition; D. C. Heath & Co.

Moral Instruction of Children: Felix Adler. International Educational Series; D. Appleton & Co.

Genetic Psychology for Teachers: By Judd. International Educational Series; D. Appleton & Co.

Education as a Science: Alexander Bain. International Educational Series; D. Appleton & Co.

Education of Man: Friedrich Froebel. Trans. by Hailmann. International Educational Series; D. Appleton & Co.

Science of Education: Herbart. Trans. by Felkin; D. C. Heath & Co.

Philosophy of Education: Johann Rosenkranz. Trans. by Brackett. International Educational Series; D. Appleton & Co.

Education: Herbert Spencer. International Educational Series; D. Appleton & Co.

Emile: Rousseau. Trans. by Payne. International Educational Series. D. Appleton & Co.

Education of the Young in the Republic of Plato: Bosanquet.

Lectures on Pedagogy: Compayre. Trans. by Payne; D. C. Heath & Co.

On Teaching; Its Ends and Aims: Henry Calderwood; Macmillan Co.

Theory and Practice of Teaching: Edward Thring. $1.00; Macmillan Co.

Report of Committee of Fifteen: Dr. W. T. Harris and others.

The reports on various phases of modern education by Special Committees of the National Educational Association of the United States, form an invaluable series of monographs.

Essentials of Method: Charles de Garmo. D. C. Heath & Co.

Lectures on Language and the Linguistic Method in School: Prof. S. S. Laurie, Edinburgh.

Teaching the Language Arts: B. A. Hinsdale. International Education Series; D. Appleton & Co.

English: George R. Carpenter and Franklin T. Baker. American Teacher's Series; Longmans, Green &. Co.

Teaching of English: Teacher's Professional Library. By Percival Chubb. Macmillan Co.

Teaching of Modern Foreign Languages in Our Secondary Schools: By Karl Bruell. Cambridge University Press.

Methods of Teaching Modern Languages: Papers by eminent instructors; D. C. Heath & Co.

Art of Teaching and Studying Languages: Francis Gouin. Trans. by Swan and Betis; Philip, London.

A Practical Study of Languages: Henry Sweet. Henry Holt & Co., 1900. Very good.

Hints on Teaching French: With commentary to Dent's First and Second French books. By W. Rippman. 1s 6d; J. M. Dent & Co. There is a companion work on Teaching German.

How to Study: By Hinsdale. American Book Co.

Guides for Science Teaching: Published under the auspices of the Boston Society of Natural History; D. C. Heath & Co.

Report of Committee of Twelve of the Modern Language Association of America: D. C. Heath & Co. Very valuable papers are to be found among the transactions of this Association.

Study of History in Schools: Report of the American Historical Association, by the Committee of Seven. 50c; Macmillan Co.

Methods of Teaching and Studying History: G. Stanley Hall, editor. Papers by eminent teachers. $1.50; D. C. Heath & Co.

Teaching of History, History and Civics in the Elementary and Secondary Schools: Prof. Henry E. Bourne. American Teachers' Series; Longmans, Green & Co.

How to Study and Teach History: Prof. B. A. Hinsdale. International Educational Series; D. Appleton & Co.

Latin and Greek: Charles E. Bennett and George P. Bristol. American Teachers' Series. $1.50; Longmans, Green & Co.

The Schoolmaster: Roger Ascham. George Bell & Sons. An excellent presentation of the Renaissance method of teaching the classical languages.

Teaching of Mathematics in the Higher Schools of Prussia: By J. W. A. Young. 80c; Longmans, Green & Co. An account of the Prussian higher school system, with a suggestive description of the work which these schools do in mathematics.

Mathematics: By J. W. A. Young. American Teachers' Series; Longmans, Green & Co.

Teaching of Elementary Mathematics: D. E. Smith. $1.00; Macmillan Co.

Mathematical Teaching and Its Modern Methods: T. H. Stafford; D. C. Heath & Co.

Psychology of Number: Dewey and McLellan. D. Appleton & Co.

Systematic Science Teaching: E. G. Howe. International Scientific Series. $1.50; D. Appleton & Co.

Teaching Botanist: Manual of information upon botanical instruction, with outlines and directions for a comprehensive elementary course. Prof. W. F. Ganong. $1.10; Macmillan Co.

Chemistry and Physics: Alexander Smith and Edwin H. Hall. American Teachers' Series; Longmans, Green & Co.

Biology (Nature Study, Botany and Zoology): Francis E. Lloyd and Maurice E. Bigelow. American Teachers' Series; Longmans, Green & Co.

Nature Study and Life: Hodge. Ginn & Co., 1902. Most excellent.

The New Basis of Geography: Redway. Macmillan Co., 1901. The best book on the subject.

Teaching of Geography: Handbook for teachers. Sir Archibald Geikie. 60c; Macmillan Co.

How to Teach Primary Geography: A. E. Frye. Ginn & Co.

Training of the Young in the Laws of Sex: By Littleton. $1.00; Longmans, Green & Co.

Addresses and Proceedings of the National Educational Association of the United States, from 1858 to date.

Proceedings of the International Conference on Education (1881): 5 vols. Eyre and Spottiswoode, London.

Report of the Massachusetts Commission on Manual Training and Industrial Education: Boston.

Reports of Royal Commission on Secondary Education: 9 vols. Eyre and Spottiswoode, London.

Report of the Conference on Secondary Education in England: Clarendon Press, Oxford, 1894.

Reports of the Commissioner of Education of the United States, from 1867 to Date.

Special Reports on Educational Subjects: Education Department, London. M. E. Sadler, director. Eyre and Spottiswoode, London. Cheap and most excellent.

XXV. PERIODICALS.

Current History: Published monthly, with illustrations. A monthly summary of contemporary history. 15c a number; $1.50 a year; The Current History Co., Boston.

Current Encyclopedia: A record of current events, published monthly. $5.00 a year; Modern Research Society, 912-916 LaSalle street, Chicago. Each number is constructed on the same plan as a Year-Book or Annual Cyclopedia, contains from 128 to 160 pp. and furnishes the latest information on all subjects. Edited by a large and competent corps of writers.

Pedagogical Seminary: Published by G. Stanley Hall. $5.00 a year.

School Review: A journal of secondary education, published by the University of Chicago. $1.50.

Educational Review: Published by Nicholas M. Butler, Columbia University. $3.00.

School Journal (New York) of June 27th, 1896; May 14th, 1898; April 15th, 1899. For prices of unmounted photographs and names of foreign photographers in Italy, France, etc., see April 4th, 1896.

School Room Decorations in Ontario: Historical and patriotic. By J. George Hodgins. Education Department, Ontario.

School Sanitation and Decoration: By Burrage and Bailey. D. C. Heath & Co. A very suggestive work, beautifully illustrated. Art subjects are well treated.

XXVII. CATALOGUES.

In each section of this catalogue are the names of such works as contain lists of books in the different departments of study. The following catalogues will also be found serviceable:

Report of Committee on the Relations of Public Libraries to Public Schools: National Educational Association, University of Chicago Press. A very valuable work. Besides discussing the formation of public libraries, it contains lists of books suitable for supplementary reading in the high and public schools.

Graded and Annotated Catalogue of Books in the Carnegie Library of Pittsburg for the Use of the City Schools: (317 pp.). 60c. Edwin H. Anderson, librarian. Contains classified lists of books suitable for the different grades of the grammar (public) and high schools of the United States. The character of each book is also described.

Catalogue of Books Authorized to Be Used in Public School Libraries, Boroughs of Manhattan and the Bronx: Wyn Koop, Hallenbeck, Crawford & Co., New York. Also an extensive and up-to-date collection, but not so well classified as either of the preceding.

Catalogue of English Prose Fiction: (190 pp.). 60c; Public library, Brookline, Mass.

Subject-Index to Prose Fiction: Dixson. Dodd, Mead & Co., New York, 1897

XXVIII. PROJECTION LANTERNS, SLIDES, ETC.

Soule Art Co., Roxbury, Mass.

Wm. H. Pierce & Co., 352 Washington street, Boston, Mass.

T. H. McAllister, 49 Nassau street, New York.

J. B. Colt & Co., 115 and 117 Nassau street, New York.

ADDENDUM.

Latin Authors and Commentaries.

[Note.—It is assumed that every library contains the standard American editions of the Latin authors prescribed for entrance to college.]

Caesar: The Gallic War: Edited with notes by Rev. John Bond and A. S. Walpole. The Macmillan Co., New York.

Caesar: The Commentaries (for schools) with notes and maps. Chas. E. Moberly. The Clarendon Press, Oxford.

Caesar: De Bello Gallico. Edited with notes by G. Long. Geo. Bell & Sons, London, 1880.

Caesar: De Bello Gallico. In five volumes. By A. G. Peskett. The University Press, Cambridge, 1878-82.

Ancient Classics for English Readers: Edited by W. L. Collins. J. B. Lippincott Co., Philadelphia.

Caesar; A History of the Art of War among the Romans down to the end of the Roman Empire, with detailed account of the Campaigns of Caius Julius Caesar: T. A. Dodge. Houghton, Mifflin & Co., Boston, 1892; second edition, 1893.

Julius Caesar and the Foundation of the Roman Imperial System: W. W. Fowler. G. P. Putnam's Sons, New York, 1892.

Caesar: A Sketch: J. A. Froude. Charles Scribner's Sons, New York, 1879.

Caesar's Army: A Study of the Military Art of the Romans in the Last Days of the Republic. H. P. Judson. Ginn & Co., Boston, 1888.

History of Julius Caesar: Napoleon III. Translated. Harper & Bro., New York, 1865-66.

Bilder Atlas zu Caesar's Büchern de Bello Gallico. R. Oehler. Schmidt & Günther, Leipzig, 1890.

Cicero and His Friends: G. Boissier. G. P. Putnam's Sons, New York.

Roman Life in the Days of Cicero: A. J. Church. Dodd, Mead & Co., New York, 1884.

The Student's Cicero: W. Y. Fausset. The Macmillan Co., New York, 1890.

Life of Marcus Tullius Cicero: Wm. Forsyth. Chas. Scribner's Sons, New York, 1865.

Roman Triumvirates: Chas. Merivale. Chas. Scribner's Sons, New York.

Cicero and the Fall of the Roman Republic: J. L. Strachan-Davidson. G. P. Putnam's Sons, New York, 1894.

The Life of Cicero: A. Trollope. Harper & Bros., New York, 1880.

Cicero: The Orations, with a commentary by George Long. 4 vols.; George Bell & Sons, London, 1855-62.

Cicero; The Catiline Orations: Edited by A. S. Wilkins. The Macmillan Co., New York.

Cicero: Pro Lege Manilia: Edited by A. S. Wilkins. The Macmillan Co., New York.

The Correspondence of Marcus Tullius Cicero; Arranged according to its Chronological Order: Edited by R. Y. Tyrrell and L. C. Purser. The Macmillan Co., New York, 1879-94.

Cicero: Selected Letters with notes by C. E. Prichard and E. R. Bernard. The Clarendon Press, Oxford.

Cicero: Pro Archia Poeta: Edited by J. S. Reid. The University Press, Cambridge.

Cicero: Select Letters: Edited by Albert Watson; fourth edition. The Clarendon Press, Oxford.

Country of Horace and Virgil: G. Boissier. G. P. Putnam's Sons, New York, 1896.

Stories from Virgil: A. J. Church. Dodd, Mead & Co., New York.

Virgil in the Middle Ages: D. Comparetti. The Macmillan Co., New York.

The Aeneid of Virgil: Translated into English Verse: J. Conington. A. C. Armstrong & Son, New York, 1894.

Legends of Virgil: C. G. Leland. The Macmillan Co., New York, 1900.

Translation of Virgil's Georgics and Eclogues: J. W. Mackail. Longman's, Green & Co., New York.

Translation of the Aeneid: J. W. Mackail. The Macmillan Co., New York.

Essays, Classical: F. W. H. Myers. The Macmillan Co., New York, 1897.

Lectures and Essays: H. Nettleship. Clarendon Press, Oxford, 1885.

Roman Poets of the Augustan Age: Virgil: W. Y. Sellar; third edition. Clarendon Press, Oxford, 1897.

Master Virgil: J. S. Tunison. Robt. Clark & Co., Cincinnati, 1890.

Latin Poetry: R. Y. Tyrrell. Houghton, Mifflin & Co., New York, 1895.

P. Virgili Maronis Opera: The works of Virgil, with a commentary; vols. I. and II., by J. Conington; vol. III., second edition, by J. Conington and H. Nettleship. The Macmillan Co., New York, 1872-76.

Virgil: With an introduction and notes by T. L. Papillon and A. E. Haigh. The Macmillan Co., New York, 1892.

P. Virgili Maronis Aeneidos: Libri I.—XII. Edited with notes by A. Sedgwick. The University Press, Cambridge.

Virgil: Aeneid Books I.—VI. By T. E. Page. The Macmillan Co., New York.

Ovid: The Fasti. Edited by F. A. Poley. George Bell & Sons, London.

Ovid: The Heroides. Edited by E. S. Schuckburgh. The Macmillan Co., New York.

Ovid: The Amores and Ars Amatoria. Edited by H. Williams. George Bell & Sons, London.

Ovid: The Metamorphoses. Books I.—III. and XIII.—XIV. Edited by C. Simmons. The Macmillan Co., New York.

Ovid: Tristia. Book I. and Book III. Edited by S. C. Owen. The Clarendon Press, Oxford, 1890.

Ovid: Selections. Edited by W. and G. G. Ramsey; third edition. The Clarendon Press, Oxford.

Sallust: Bellum Catilinarium and Jugurthinum. Edited by W. W. Capes. The Clarendon Press, Oxford.

Sallust: Catilina and Jugurtha. Edited by C. Merivale. The Macmillan Co., New York.

Sallust: Bellum Catilinae. Edited by M. Cook. The Macmillan Co., New York.

Sallust: Catilina and Jugurtha. Edited by G. Long and J. G. Fraser. George Bell & Sons, London.

VOL. II. NO. 1.

INVESTIGATIONS

OF THE

Departments of Psychology and Education

OF THE

UNIVERSITY OF COLORADO.

CONTENTS:

Published by the

UNIVERSITY OF COLORADO,

Boulder, Colo., March, 1904.

On the 24th of November, 1903, occurred the death of Doctor Arthur Allin, Professor of Psychology and Education in the University of Colorado. He was editor of the "Investigations," and under his editorship four issues appeared.

THE SCOPE AND EFFICIENCY

OF THE

NORMAL SCHOOLS OF THE UNITED STATES.†

By Frank H. Clark.

I. Introductory.

The Normal School problem is one which vitally concerns the school men of the nation, whatever be their field of labor. It has justly attracted the best thought of our educators for years past, and is still pressing for solution.

Early in the past century the influence of Germany began to make itself felt in this country, with the result that in 1823, Mr. S. R. Hall opened a school for the training of teachers in Concord, Vt. Six years later, Mr. J. W. Bradbury opened a similar school at Effingham, N. H. (1), and others followed. Prior to this, however, a model school was established in the city of Philadelphia, for the purpose of preparing skilled teachers in the monitorial system of Bell and Lancaster. (2) This occurred in 1819, but the institution did not long survive, and not much of permanent influence came from it; nor were the efforts of Mr. Hall and Mr. Bradbury of more than local and temporary benefit. It remained for Mr. J. G. Carter, of Lancaster, Mass., and "Father Peirce" to take the steps which marked the pathway to our prevailing Normal School system. (3) In 1839, the Lexington school was established, and those at Barrie and Bridgewater, in 1840. (4)

These schools were established in the hope that such an agency would reform and vitalize the whole system of elementary education. (5)

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†This investigation was conducted in the Department of Psychology and Education, under Professor Arthur Allin's supervision. It was submitted as a master's thesis, and some time has elapsed since it was put into its final shape. It is owing to the sickness and death of Doctor Allin that its publication has been delayed.

(1) Report of Com. of Twelve, N. E. A. Proc. 1897, pp. 462-3.
Appendix K, to same report.
Hinsdale, Training of Teachers, Butler's Ed. in U. S., p. 368.

(2) Hinsdale, Ibid, 368.

(3) J. P. Gordy, Rise and Growth of Normal School Idea in U. S., 1891, p. 13.
M. A. Newell, Contributions to Hist. of Normal Schools in U. S.
Report of Comr. of Ed., 1898-99, p. 2263.

(4) Idem., p. 2267.

(5) Idem., p. 2360.

John Quincy Adams, Daniel Webster and Horace Mann were stalwart friends of the new movement, but it was Cyrus Peirce that made the venture a success. (1) These schools worked a great good—they did "reform and vitalize the system of elementary education." But more remained to be done, and the constantly improving system has ever been seeking new and better ways and means of accomplishing the highest possible good.

There are to-day 166 public normal schools, 165 private normals, and over 220 pedagogical departments in our colleges and universities. Many public and private high schools and academies are doing more or less *normal* work. All this furnishes an unanswerable argument that the Normal School Idea is a popular one in this country, and that the Normal School has had and still has a mission. (2) In the N. E. A. proceedings for 1865, 1871, 1872, 1873, 1883 and 1885, the question was discussed fully and freely. Improvements steadily continued.

President Taylor, in 1886, at Topeka, presented the "Report of the Committee on the Organization, Courses of Study, and Methods of Instruction in the Normal Schools of the United States," and the Chicago committee was appointed in 1887, to continue this investigation. This committee reported in 1889, and each succeeding meeting of the N. E. A. witnessed a growing interest in the problem, until at Denver, in 1895, a committee was appointed for the exhaustive study of the points at issue.

Preliminary reports in 1897 and 1898 were followed by a full report at the Los Angeles meeting in 1899, which report is the strongest presentation of the problem, and offers the best solution of it that has thus far been given the workers of the country.

A profound interest in the question, and the thought that perhaps a study thereof by one not directly connected with the normal school work, might reveal some things not yet known to the writer, and not apparent in the report of 1899, is the only excuse for this investigation. Some unexpected developments have resulted, which may be of interest to others as well as the writer.

In the progress of this study the following sources have been consulted. Some have been prolific in material of value. Others not so:

Replies to Questionaires—Two hundred forty-five in number.
- From Normal School Presidents—54 answers; 42 state, 12 private.
- From Normal School Graduates—88 answers.
- From State, City and County Superintendents, and others who had observed the work of the Normal Graduates—103 answers.

Cook, Seerley, et al.: Personal letters.
Burk: Teasing and Bullying, Ped. Sem., Apr., 1897.
Hall: Ped. Sem., June, 1902.
Butler: Ped. Sem., June, 1902.
Ellis: Normal School Course in Psychology. So. Ed. Assoc., Dec., 1901.
Groos: Play of Animals, Intro. and pp. 84 ff.
Newall: Contributions to the Hist. of Normal Schools, in Report of the Comr. of Education, 1898-99, Vol. 2, pp. 2265-2267.

(1) Gordy, Rise and Growth of N. S. Idea in the U. S., pp. 47, 49, 50, 51.
(2) Report of Comr. of Ed., 1898-99, p. 1730.

Harris: The Future of the Normal School, Reprint Ed., Rev. Jan., 99, pp 5-6. Report of Comr. of Ed., 1898-99, Vol. 2, p. 1789.
Hinsdale: The Training of Teachers in Education in the U. S. (Butler), Vol 1, pp. 368, 73, 78, 93, 94, 96, 404-6.
Gordy: History of the Nor. Sch. Idea in the U. S.; Its Rise and Growth. Pub. by Bureau of Education, 1891, pp. 13, 76, 89, 96-7.
Mace: The Central Defect of the Nor. Sch., Ed. Rev. Feb., 1901, pp. 132-3, 137.
Catalogues of State Nor. Sch., N. H., 1899, p. 41; N. J., 1900, p. 17; Terre Haute, Ind., 1900, p. 56; Winona, Minn., 1900, p. 8; West Superior, Wis., 1900, pp. 6 and 47.
N. E. A. Proceedings—
1886—Boyden: Address, pp. 389, 392.
Taylor: Com. Report, pp. 396-7-8.
1887—De Garmo: Germ. System of Nor. Sch., pp. 489-490.
1888—Parr: The Nor. Sch. Problem, pp. 471-2.
Kirke: Relation of N. S. to Academic, pp. 506-7.
Shepard: Discussion, p. 479.
Baldwin: Distinctive Work of the N. S., pp. 477-8.
Washburne: N. S. Curriculum, p. 487.
Harris: Discussion, p. 494.
Allen: The Training School, p. 501.
1889—Hinsdale: Pedagogical Chairs, pp. 559, 561, 563.
Report of "Chicago Com." In general.
1891—Sabin: Preparation of Teachers, pp. 515, 517.
Hinsdale: Academic and Professional, pp. 717-8.
Dunton: Discussion, p. 740.
Marble: Discussion, p. 521.
1894—Lord: Scholarship in N. S., pp. 850-1-2.
Com. Report, N. S. and Univ., p. 824.
Boone: The Teacher as an Expert, p. 857.
Green: Academic Function of N. S., p. 854.
Cook: Discussion, p. 868.
Rounds: Discussion, p. 869.
Ramsay: Discussion, p. 870.
1895—Cook: Discussion, p. 717.
Scheffer: Function of N. S. in Correlation, pp. 710, 712.
Stout: Practice Teaching, pp. 701-2.
1896—Sheldon: Practice School, pp. 656-7-8, 660.
McVicar: Discussion, p. 665.
Hall: Rein's Practice Schools, p. 647.
1897—Report Com. of Twelve, pp. 462-3-4-5-6. Appendix S., p. 583.
Bradbury: Appendix K., p. 563.
1898—Boone: Discussion, p. 742.
Brown: Entrance Requirements, p. 734.
Boyden: Minimum Entrance Requirements, p. 729.
Seerley: Minimum Entrance Requirements, p. 738.
1899—Boyden: Appendix B, Report of Com. on N. S., pp. 885-6.
Report of Com. on Nor. Sch., pp. 636-903.
Russell: Training for Secondary Schools, pp. 288-9, 290, 295.
Edmund: Child Study, p. 1033.

No mention made of articles read from which particular citations are not made. The above references are direct.

The following will indicate the general plan of the discussion:

I. Introduction, including bibliography and outline.

II. Summary of replies to questionaires:

1. From Normal School Presidents.
2. From Normal School Graduates.

3. From Superintendents and others, observers of graduates' work.

III. Statement Concerning Personal Letters.

IV. Comparative Summary of the replies received to certain questions of equivalent import in the three sets of questionaires.

V. The True Scope of Normal Schools in the United States.
   1. What may the entering student legitimately expect to find?
   2. What may the Normal School legitimately demand of student?
      a. On entrance.
      b. What after entering and during the course?
   3. Who may graduate, and to what is the graduate entitled?
   4. For what class of schools should graduates be prepared?
   5. Needs and suggestions for securing greater efficiency.

VI. Observation and Practice Schools.

VII. Training for Secondary School Work, and Pedagogical Chairs in Colleges and Universities.

VIII. Suggestions as to the Future of the Normal School.
Scope and Efficiency, etc.

IX. Conclusions.

II. Summary of Replies to Questionaires.

1. From Normal School Presidents.

One hundred thirty-three questionaires were sent to Normal School Presidents, no section or state being omitted. Fifty-four answers were received, tabulated and summarized, with the following results:

1. Does the report on Normal Schools (N. E. A. Proceedings, 1899, pp. 836 ff) present a reasonably satisfactory solution of the N. S. problem?
   a. As to conditions for entrance.
      54 per cent. reply Yes. 18 per cent., Think so. 18 per cent., No. 10 per cent., no answer.
   b. As to length of minimum course.
      78 per cent., Yes. 12 per cent., No.
   c. As to minimum course.
      78 per cent., Yes. 12 per cent., No.
   d. In general.
      40 per cent., Yes. 25 per cent., No. Remainder not answering.

2. Is the present N. S. graduate a satisfactory product in view of his expenses to the State and the opportunities offered?
   52 per cent., Yes. 38 per cent., Hardly. 10 per cent., No.
   If not—
   a. Does the fault lie in the Normal School system?
      30 per cent., Yes. 40 per cent., No. 12 per cent., Don't know.
   b. Does it lie with the faculty of the school, owing possibly to narrowness of view, lack of scientific equipment and training, or to insufficient experience and acquaintance with practical need?
      70 per cent., Yes. 22 per cent., No.

c. Is it the result of insufficient training of the student prior to his admission to the school?

62 per cent., Yes. 23 per cent., No.

3. Which should have the greater relative emphasis in Normal School courses—Professional or Academic studies?

Professional work is the true scope of the Normal School, but Academic studies are important as the vehicle for imparting the professional training. In some localities the academic studies must first be given, but this should always be from the teacher's point of view. Subject matter a prerequisite.

4. Is Methodology relatively overemphasized?

75 per cent., Yes. 20 per cent., No.

5. Is it wise economy to duplicate subjects already traversed by students in the secondary schools, or is such action necessary?

40 per cent., Yes, more or less a necessity.

40 per cent., Yes, from a different viewpoint, to make professional work concrete and of practical application.

6. What is the present tendency in the further development of the Normal School idea?

Towards higher standards for admission.

More real practice under real conditions. Model schools are too often artificial schools.

Higher excellence in critic teachers, with more thorough practical experience combined with training in theory.

Towards making the child the center of study and the basis of the work of the school in all its departments.

More Normal Schools, with smaller enrollments. Too few and too large.

Better equipment, particularly for laboratory work.

Some think the tendency is towards more academic work and manual training. (This view comes largely from the South.)

More think the tendency is decidedly towards more distinctive professional work and training.

Broader and deeper scholarship in faculties.

Greater effort towards imparting true culture. Too many boorish students, good-hearted and capable. Should be kept longer and culture trained.

2. From Normal School Graduates.

This list of questions was sent to one hundred sixty-eight Normal graduates, of from three to twenty years' experience since graduation, nearly all still engaged in teaching. The list embraces college and normal school presidents, city and county superintendents, and teachers in city and graded and rural schools.

Eighty-eight replies were received, which were likewise tabulated and summarized, as follows:

In the light of your experience since graduating from the Normal School:

1. Was the training given you in the Normal School satisfactory and efficient?

   30 per cent., Yes. 26 per cent., Partly so. 44 per cent., No.

   If not—

   a. Does the fault lie with the Normal School system?

   43 per cent., Yes. 15 per cent., Doubtful. 22 per cent., No.

   b. Does it lie with the faculty of the schools, owing possibly to narrowness of view, lack of scientific equipment and training, or to insufficient experience and acquaintance with actual needs?

   56 per cent., Yes. 25 per cent., No.

   c. Is it owing to insufficient training and preparation before entered the Normal School?

   60 per cent., Yes. 40 per cent., No.

2. Do you advise that greater relative emphasis be laid on either professional or academic studies in the Normal courses? Which, if either?

   A few replies advised greater emphasis on professional.

   More advise greater emphasis on academic.

   About 30 per cent. advise professional, provided the academic is well done before admission to the Normal School.

   About 30 per cent. urge that greater emphasis be laid on the professional work with the academic studies as the basis.

3. Is the importance of Methodology relatively overemphasized?

   46 per cent., Yes. 54 per cent., No.

4. Do you believe that your training would have been more efficient and satisfactory if it had been procured in a recognized college where courses in Pedagogy, Sociology and Psychology are either offered as electives or required?

   40 per cent., Yes. 60 per cent., No.

   If so, why and how?

In replying to the second part of this question, the following replies were frequently made and are fairly representative:

Normal School idea correct.

College pedagogical work weak professionally.

College-trained teachers broader scholarship, more cultured, maturer.

Greater maturity in entering and graduating from Normal and Professional Schools urged by a considerable number.

5. Kindly suggest means which, in your opinion, would render the training of the Normal School more efficient and positive.

Approximately correct series of percentages were obtainable from the tabulations of these replies, by reason of a rather unusual degree of uniformity in their phraseology and meaning.

Higher entrance requirements, 50 per cent.

Higher graduation requirements, 25 per cent.

Broader scholarship and more culture in faculties, 65 per cent.

Faculties of actual experience in the work for which we are being prepared. Men and women acquainted with actual needs, 45 per cent.

Experienced and cultured critic teachers, too many theorists, 41 per cent.

Academic studies only as basis for professional training, 35 per cent.

More real practice training under actual conditions, 30 per cent.

(Model Schools, "artificial toys.")

Courage to refuse graduation to those not of proven fitness for teaching, 20 per cent.

More money, more schools, smaller enrollments, 20 per cent.

Fewer *method* cranks, hobby riders, and *device* worshippers. These last expressions were thrown in at more or less frequent intervals, but not tabulated, being too sporadic.

The evident spirit was one of loyalty to the Normal Schools, but with an apparent feeling that there were remediable faults which called for correction. Frank and kindly expression along this line were frequent in the replies and in accompanying letters.

3. From Superintendents and Others.

One hundred seventy-four question lists were sent to state, city and county superintendents, and to others in position to observe the work of Normal School graduates. To these one hundred three replies were sent, which yielded the following results:

In so far as you have observed the work of Normal School graduates:

1. Is the present Normal School graduate a satisfactory product, in view of his expense to the State and the opportunities offered him?

27 per cent., Yes. 37 per cent, No. 14 per cent., Fairly so. 20 per cent., Doubtful.

If not—

a. Does the fault lie with the Normal School *system?*

30 per cent., Yes. 20 per cent., No. 29 per cent., Partly.

b. Does it lie with the faculty of the school, owing possibly to narrowness of view, lack of scientific equipment and training, or insufficient experience and acquaintance with actual needs?

66 per cent., Yes. 6 per cent., No.

An analysis of the 66 per cent. answering Yes to this question, which is divisible, shows the following:

11 per cent., To narrowness of view.

15 per cent., To lack of scholarship.

40 per cent., To insufficient experience and acquaintance with actual needs. (On what observation or knowledge of the faculties these views are based, the writer is unable to state. What proportion of these faculties are men and women of experience in public school work does not appear in this investigation.)

c. Is it the result of insufficient training of the student prior to his admission to the Normal School?

66 per cent., Yes. 14 per cent., No.

2. Should there be greater relative emphasis laid upon either professional or academic studies in the Normal School courses?

Professional, when preceded by proper academic work. If not, the academic must be given.

Academic as the basis of professional training is certainly the proper order.

(These are the substance of nearly every reply.)

3. Is the importance of methods relatively overemphasized?

60 per cent., Yes. 9 per cent., Possibly. 22 per cent., No.

4. What advantages, if any, accrue to those teachers who receive their training in a recognized college where courses in Psychology and Pedagogy are either offered as electives or required?

Broader scholarship and culture, more power, clearer independent thinkers. College courses with pedagogical work better for high school teachers. Normal trained better for the grades. Combination of college and Normal training the best product.

5. Kindly suggest means by which the efficiency of Normal School graduates may be made more positive and evident in their work.

Raise standards of admission.

Courage and freedom in culling incompetents.

Real practice work under real conditions, as they obtain in the public school experience after graduation.

Actual successful experience after graduation, before final diploma is granted, or life license issued. Fitness must be proven.

Less pedantry, bookish and stereotyped methods, devices, etc., under the caption of *Methods*.

Broader grasp of the great underlying principles of True Method.

Better instructors with broader scholarship and experience.

More Normal Schools. Smaller enrollments.

III. Statement Concerning Personal Letters.

From the parties making replies, a large number of letters was received. These have given further explanation of views on the questions raised, and on other and kindred points. Some few were pessimistic and critical, expressing the view that all this investigation by committees and individuals was out of place and non-helpful, and holding that the Normal School problem, if let alone, would work itself out by a natural process of development. On the other hand, the frankness and freedom with which views were expressed, and the emphasis laid upon certain points, go far to prove that strong men and women are thinking deeply and positively on the question, and are graciously ready to give every assistance in the attempted solutions

of the problems. The writer is glad to acknowledge his indebtedness to all these.

The letters of President John W. Cook, of De Kalb, Ill.; President H. H. Seerley, Cedar Falls, Iowa; President W. H. H. Beadle, Madison, So. Dak.; Superintendent John Morris, Covington, Ky., and E. D. Y. Culbertson, Ames, Iowa, and some others, were particularly suggestive and helpful. Each has been appreciated, and if their ideas are correctly developed in this study the paper will have that merit, if none other.

IV. Comparative Summary of the Replies to Certain Questions of Equivalent Import in the Three Sets of Questionaires.

It will be observed that the lists of questions bear along similar and related lines, being identically worded in part.

Questions 2, 3, 4, in that addressed to N. S. Presidents tally with 1, 2, 3 in each of the others, whilst number 5 is the same as those addressed to Normal graduates and superintendents, and productive of similar replies as that numbered 6 in the presidents' list.

A comparison of these replies is of interest:

Replying to the question relative to the efficiency of the Normal School training and the character of the product, 52 per cent. of the presidents, 30 per cent. of the graduates, and 27 per cent. of those who observe their work hold the product to be satisfactory. It is declared unsatisfactory by 10 per cent. of the presidents, 44 per cent. of the graduates themselves, and 37 per cent. of the observers. Those occupying middle or doubtful ground number 38 per cent. of the presidents, 26 per cent of the graduates, and 24 per cent. of those who inspect the product.

In attempting to locate the fault for whatever of unsatisfactory product is turned out, it will be seen by a similar comparison of replies to a, b, c, of this question, that about one-third deem the fault to rest wholly or in part on the system itself. The larger proportion, however, approximately agree that the great trouble lies: First, in the lack of adequate academic training of those who seek admission to the Normal School, and second, in the fact that the faculties are too frequently composed, either in whole or in part, of those who are themselves lacking either, a. Good academic foundation and scholarship sufficient to become competent leaders and trainers of those who are to become leaders and trainers of others, or b. In that breadth of view and grasp of the entire scope of their work which is necessary to a presentation of the different divisions with due regard to the relative importance they bear to each other.

(Overcoming this difficulty will prevent an overemphasis of the one and the neglect of the other. Hobby riders, and rank enthusiasts will thus be excluded from the faculties, and broad-minded, conservative men, possessed withal of magnetism and power of inspiration arising from the contemplation of high ideals and comprehensives, will occupy their places) or c.

That intimate acquaintance with actual conditions which can arise only from experience in the public schools for which the student-teacher is being prepared.

Given, a man of such experience, graft upon him a knowledge of the History and Theory of Education, combined with a comprehensive study of psychology and the child, and the product is an ideal one for membership in a Normal School faculty, provided, of course, the natural teaching quality is there as a core on which to construct these acquired qualifications.

Some of the correspondents state that in not a few of the "so-called" Normal Schools (private or independent generally) this lack of necessary qualifications is characteristic of the faculty, and further that this is not confined to the private or independent schools.

A number of the Normal School presidents recognize the existing conditions and confess the same, but ascribe the cause to insufficient funds. This is doubtless correct, but it may well be asked, Is it not the part of wisdom to undertake less work, establish fewer departments, and place only experienced and thoroughly equipped teachers in charge? Do we not tend towards large enrollments and many departments at the expense of excellence of work?

It is very difficult to meet the requirements, even in part, and the Normal School authorities are doubtless often in sore straits between the demand for teachers to supply the schools and the desire to send out only a first-class product, even though it be limited as to the number of graduates. Between the demand and the desire it is certainly difficult, to steer a true and proper course, and all honor to the many who are persistently striving to accomplish the latter without totally disregarding the former. The attempt to cover both points is sometimes distressingly humorous. The range of subjects offered in one Normal School course is sometimes simply astonishing. As a result the limited time permitted to one study is wholly inadequate, and the condition of the mind of a student completing (?) such a course must be one bordering on chaos. A very interesting presentation of such conditions and their results is given by Thomas H. Kirke, in an address on "The Relation of the Normal School to the Academic Schools." (1)

In the face of all this, however, the fact remains that a great difficulty lies in the insufficient preparation of the students entering the Normal Schools. In attempting to take them as they are and to give them the requisite training, the relative importance of professional and academic studies (which is the next point of agreement in the three sets of questions) becomes a mooted question and admits of the great variety of answers received. The literature on this subject is also abundant and the views expressed widely variant. Out of it all, however, comes a clear note of agreement and harmony:

"Educating teachers is the work of the Normal School." (2) "The first correlating idea of the Normal School is its function as a professional

(1) N. E. A. Proceedings, 1888, pp. 506-7.
(2) Baldwin, Distinctive Work of the N. S., N. E. A., 1888, p. 477.

school. Its aim is the preparation of men and women for the practice of the art of teaching." (1) "The function of the Normal School is to prepare teachers." (2)

To train teachers then is the supreme purpose of the Normal School. But the foundation on which to base this training is certainly, in the opinions expressed, a *sine qua non*. The Normal School finds it an imperative necessity to do this foundation work, but even this may be done in a thoroughly professional way, and from the standpoint of the teacher who is to present the academic subjects to the children. If the study of the academic branches from this point of view is admitted to be a professional study, then the majority of those replying to this question will agree with the view that "the professional work is the only true and proper work of the Normal, and the question of 'which?' cannot be raised." Many local conditions force a modification of our ideal, but the true Normal School is essentially professional. (3)

The next question common to the three sets of questionaires relate to the possible overemphasis of Methodology, and develops a large and important element in each class (N. S. presidents, N. S. graduates and observers of the practical work of the latter), which believes that too much emphasis, relatively speaking, is laid on methods, so-called. Explanatory letters and remarks would make it appear that the broad underlying principles, denominated "Method in Education," is not, indeed cannot, be overemphasized, and that "Methods in Teaching" must be distinguished therefrom. One of the best statements on this point comes from the pen of Dr. James M. Milne, of New York. I take the liberty of full quotation:

"Methods of Education and Methods of Teaching are frequently confounded. Methods of Education belong to the centuries, and are the product of their growth. They are the principles of processes that are common to all subjects. They are deeply rooted in philosophical axioms and psychological verities. Of slow growth, they are of necessity difficult of modification and change. Methods of Teaching draw their nutriment from general methods of education. They belong to different times; are modified by applica-

(1) Cook, Co-ordination of Studies in Normal Schools, N. E. A., 1895, p. 717.
(2) Committee Report, N. E. A., 1899, p. 838.
(3) Com. Report, Taylor, N. E. A., 1886, pp. 396-7-8.
Shepard, Discussion, N. E. A., 1888, p. 479.
Washburne, The Nor. Sch. Curriculum, N. E. A., 1888, p. 487.
Hinsdale, Academical and Professional Preparation, N. E. A., 1891, pp. 717-8.
Lord, Scholarship in N. S., N. E. A., 1894, pp. 850-1-2.
DeGarmo, Com. Report, Relation of N. S. to University, N. E. A., 1894, p. 824.
Green, Academic Function of the N. S., N. E. A., 1894, p. 854.
Boone, The Teacher as an Expert, N. E. A., 1894, p. 857.
Boyden, Com. Report, Appendix B, N. E. A., 1899, p. 885.
Harris, The Future of the Nor. Sch., Ed. Rev. Jan., 1899.
Mace, Central Defect of the N. S., Ed. Rev. Feb., 1901, p. 135.
Hinsdale, Training of Teachers, Butler's Ed. in U. S., 1900, p. 373.

tion to different subjects and individuals, and are capable of change. Methods of Education direct attention to educational beliefs; Methods of Teaching to educational practices.

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A plan rises to the dignity of a method when it rests on psychological principles. Systematic instruction and methodical teaching are different, both in aim and result. The one seeks to establish truth; the other seeks to apply the truth found to the aptitude of the child, to apprehend it, and transmute it into strength. The stress of method falls, not on the system, but on the mind to be developed. A device belongs to the mechanism of methods, but it is not method. The much-boasted "my method" will generally be found on the plane of a plan, or device, or mannerism." (1)

Dr. Sheldon, when asked if he did not believe in "the method," replied, "No, but there are eternal principles, however."

Such method cannot be condemned. It belongs to the ages, not to the time, to the school, nor to the individual alone, but to all. It is all-pervasive.

The criticism which condemns methodology is directed against the all-too-common practice which magnifies "my method" and other devices unduly. Instances are not lacking in which young people of positive ability have been completely overwhelmed by the thousand and one petty devices and mannerisms of a "professor of methods" in a Normal School. Such tendency can not be too strongly condemned. Failure to show the proper subordination of devices, however excellent, to the greater method is evidently a prolific evil in all too many Normal Schools. (2)

V. The True Scope of the Normal Schools in the United States.

In the light of what has gone before, we may presume a discussion of the question, What is the true scope of the Normal School in the United States?

Fundamentally it is to prepare teachers to lead, direct and train children. (3) This has been foreshadowed above. (p. 15) They that assume this responsibility should first have attained the development which may be transfigured into character. To be guided into such an attainment the student desiring to become a true teacher seeks admission to a Normal School. In that school he has a right to expect:

1. An institution so organized that this, the fundamental unifying aim, shall be the central idea of all plans and accomplishment. William H. Mace holds that "the central defect of the Normal School is a failure to conceive adequately and carry out effectively the true idea of a Normal School into the details of organization and instruction," and again, that "unity of aim

(1) Milne, The Real Province of Method, N. E. A., 1895, p. 690.
(2) S. S. Parr, The Nor. Sch. Problem, N. E. A., 1888, pp. 471-2.
(3) Com. Report, N. E. A., 1899, p. 838.
Boyden, Distinctive Principles of N. S. Work, N. E. A., 1888, pp. 389, 392.

and effort consciously concentrated upon the heart of the problem is the exception." (1)

Other aims should be auxiliary to this alone. Extraneous or side issues should be rigidly excluded or made positively subsidiary, together with everything that does not have a direct and beneficial bearing upon the work of preparing teachers to teach school. All this implies, on the part of president and faculty:

a. Character, scholarship, culture, teaching ability, unusual power of organization, and a comprehensive grasp of their real mission.

b. A keen and discriminating judgment as to the natural endowments of those aspiring to become teachers.

c. Frankness and courage in advising those not so endowed to enter other lines of work, and in declining to continue unfit individuals as members of the student body. This includes those who by reason of immaturity or instability of purpose or character are not yet ready to begin their preparation for this the greatest of all vocations—teaching. (2)

d. A breadth and maturity of judgment which as a rule comes only to those who have themselves served an efficient apprenticeship in the work for which they are endeavoring to fit others.

After some years of teaching and supervision I visited a Normal School in which the director in training was a young man but two years out from his pedagogical and college course. Under his direction were teachers of several years' experience in the school room who had not enjoyed the advantages of professional study and training. He was fully equipped in the theory and history of education as taught by the "master," and had the work in psychology at his tongue's end. In all this he could give intelligent and interesting talks and instruction, but it would have been ludicrous were it not pathetic to note his learned and pedantic attempts to criticise the practice teaching of those who were comparatively past masters in the art of teaching and governing the little ones. Instances of this nature might be multiplied.

Learning alone is insufficient. It is Locke that once said: "Men may be greatly learned but little knowing," and Dickens, after giving a long enumeration of one of his schoolmaster's requirements, remarks, "Ah, rather overdone, Mr. Choakumchild. If he had only learnt a little less, how infinitely better he might have taught much more." Pedagogical research, psychological investigation, the study of methodology, without ample practical work in the art of teaching, can never constitute a man a teacher of teachers. We believe in scientifically equipped instructors, but practical experience is an absolute essential. (3)

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(1) Mace, The Central Defect of the Normal School, Ed. Rev. Feb., 1901, pp. 132-3.

(2) Allen, Training School as an Adjunct to the N. S., N. E. A., 1891, p. 740.
Dunton, Discussion, N. E. A., 1891, p. 740.
Wisconsin School Law, Catalogue West Superior State N. S., 1900, p. 57.

(3) Sabin, What are the Means Available for Training Teachers? N. E. A., 1891, p. 515.

All this leads logically to the conclusion that a student entering a Normal School should find a faculty of broad and liberal views, scientific training and equipment, and wide experience. These in combination will constitute a plant ideally fitted to the accomplishment of a great work.

2. Resulting from an institution so organized and a faculty so constituted, the student should find a high professional and ethical spirit permeating the entire school. (1) This means much in character development. It will put him in the right attitude towards his fellow workers, and what is more, and even better, in the attitude to recognize the relation which a true teacher bears to the child.

This naturally and logically leads to the great truth;

3. The one pivotal center of all education—the child and his environment. The Great Teacher "set a little child in the midst of them," and made him the center of his teaching. Can we do else? This is our warrant for child study—the proper kind—not for the inquisitions sometimes practiced under that title, but a rational study of the natural child (2), his loves and his hates, his labors and his plays, his tendencies, his passions, his powers and his capabilities, all these become the legitimate field of study and investigation in the work of preparing teachers to teach school. Karl Groos asserts that the "real meaning of infancy is to give time for play," and after a careful study makes a fine classification of children's plays. (3) Earl Barnes in both series of his Studies in Education also illustrates my thought. (4)

Approaching our subject from an opposite point of view, we may fairly inquire: What has the Normal School a right to demand of those seeking admission to its halls, dedicated to the work of preparing teachers to lead, direct and train children? Here our study leads us to some very positive conclusions:

1. An individual of good health, without objectionable deformity, possessed of native ability, good common sense, together with a deep sympathy and a decided reverence for the child.

2. Sufficient maturity to insure ability to comprehend subjects and their relations to the work in hand (5), and to understand the child.

3. A scholastic training equivalent to that afforded by our better high schools. Such is the evident opinion of the major portion of those replying to the last question of each of our questionaires. (See pp. 9, 10, 11, 13 of this paper).

But another and a very positive opinion would demand a somewhat lower standard of admission as to scholarship. High School graduates are too few to begin to supply the demand for material out of which to develop

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(1) Seerley, N. E. A., 1899, pp. 862-3-4.
(2) Edmund, N. E. A., 1899, p. 1033.
Burk, "Teasing and Bullying," Ped. Sem., Apr., 1897, p. 336.
(3) Groos, Play of Animals, pp. 84 ff.
(4) Barnes, Studies in Education, 1896 and 1902.
(5) Com. Report, N. E. A., 1899, p. 839.

teachers. It is all right to set the standard high and come to it if we can, but in the greater number of States such a standard is a simple impossibility. The State must and does authorize the certification of teachers on the basis of an examination covering but little more than the completion of the common branches in our rural schools. The State therefore can not possibly deny to that same individual (who is thus given authority to teach) the privilege of admission and attendance upon a school which purposes to train him *how* to teach. To empower one to perform a function, and deny him the instruction as to how to perform it well is the rankest inconsistency. An interesting line of references bear on this phase of the discussion. (1)

The tendency which demands a High School education as an admission requirement is one which draws our Normal Schools away from the rural schools more and more. *Quo Vadimus.*

4. The Normal School may further demand of the entering student a consecration to the art of teaching, to the extent of an agreement to give a stipulated number of months, or years, after graduation to the work of teaching. A pledge of such service is required of students entering some of the State Normal Schools, and justly. (2) It is not just to the State that time and money be expended in the training of teachers without some adequate return for the outlay. Neither is it just to permit the expenditure of time and money on those who are not really interested in the particular work, who simply fritter away their own time and deprive others of strong purpose and earnest desire of time and attention rightfully theirs.

After the student of these qualifications has entered, the Normal School is further justified in requiring that in addition to the completion of the prescribed course of study he shall remain a sufficient length of time before graduation to acquire a social equipment and culture that will make him an influence for the uplift of those with whom he comes in contact in his teaching work. The average term in the Normal School is entirely too brief to permit the culture influence of a good school to be felt as it, of right, should be. I find no recent statistic on this point, but in 1887 the statement was made that in the Illinois Normal School, 72 per cent. of the students did not enter upon the second year's work. (3) It is to be hoped that the percentage is lower at this date, but any one acquainted with the facts knows full well that the number dropping out of school before the social culture is attained is sadly large—a fact to be regretted.

Often the only refining culture influence entering into the life of some children is that exerted by the teacher. It is also true that students of

(1) Discussion by Cook, Rounds, Ramsey, N. E. A., 1894, pp. 868-69-70.
Report Com. of Twelve, N. E. A., 1897, pp. 463-4-5-6.
Salisbury, N. E. A., 1897, p. 734.
Com. Report, N. E. A., 1898, by Boyden, p. 729; Brown, p. 734; Seerley, p. 738.
Gordy, Rise and Growth of the N. S. Idea in the U. S., Bureau of Education, 1891, pp. 96-7.

(2) Normal School Catalogues, New Jersey, 1899, p. 17; West Superior, Wis., 1900, p. 47.

(3) DeGarmo, N. E. A., 1887, p. 489.

splendid natural qualities, who are boorish and uncultured, enter the Normal School. The change in these is sometimes swift—often astonishing. It should be brought about in all cases before graduation. It is true that nothing can give the same innate to-the-manor-born culture that comes from a childhood spent in a refined, cultured home, but often the strong characters, those of force and power, come from homes of another class. These natures possess a native virility that render them highly desirable as teachers, but it is important that they receive and profit by the social and ethical influences cast about them in an ideal Normal School, the faculty of which is constituted of refined and cultivated ladies and gentlemen who possess strong characters and magnetic temperaments, men and women who impress themselves upon their students. When strong, rugged natures are thus influenced they may be sent forth in the consciousness that they will in turn exert an influence upon the children that will be of inestimable value to the growing youth and worth everything to the State.

If the rude and uncultivated do not respond to these influences, graduation should be denied them. This may seem like strong language, but the question is a vital one if we expect the schools of the nation to be the power for good which we sometimes, in our patriotic, enthusiastic ebullitions declare them to be. On one occasion when contemplating the character and work of the teacher, Horace Mann burst forth: "What supreme folly to employ bats and moles to teach young eagles to fly." (1)

Having specified a certain class to whom, under certain conditions, the diploma of the Normal School should not be issued, let us examine more fully the question: Who may graduate, and to what is the graduate entitled? Gathering the material for our replies from the answers to our questionaires, as well as from the utterances of well known educational leaders, and our own experience and observation, we are led to say: graduate only those—

1. Who have attained a reasonable degree of efficiency in the academic branches from the teacher's standpoint, i. e., those who have a teaching knowledge of them.

2. Who are fairly well acquainted with the Science and History of Education. Economy of time and effort requires that a knowledge of the successes and failures of the past should prevent a repetition of the failures and enable one to attain like successes. The experience of the past is ours. The children of to-day should not be denied the benefit arising from a knowledge of the lessons taught by that experience.

3. Who are reasonably familiar with the psychology of the child, and with established pedagogical principles. The modern Normal School offers the opportunity to secure this familiarity, and again, we say, the benefit of such knowledge should not be denied to the child.

4. Who possess strong character as a foundation on which to base the culture and social power mentioned above, (p. 20) and

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(1) Quotation from Horace Mann, N. E. A., 1891, p. 517.
Dunton, Discussion, N. E. A., 1891, 740.

5. Who possess real sympathy for the child, and who have manifested that sympathy in actual teaching and governing, under the best conditions attainable in our Normal Schools.

The graduate fitted as above indicated is entitled to his diploma, which should set forth his attainments as judged by the faculty under whom his student life has been largely spent. This diploma should be a temporary license only, securing him a fair trial under practical conditions. During his work under this temporary authority, his work should be regularly inspected by supervisors, such as city or county superintendents, and also by some representative of the Normal School issuing the diploma. If this inspection proves the candidate to be worthy and successful, the graduate teacher should, after this worthiness has been sufficiently established (usually after one or two years' work), be given a life certificate as a teacher of *proven* fitness, worthy of the honor and trust implied in such a document.

Some of the States are now following the probationary plan, requiring from eight months to two years successful work as a condition of the life certificate to teach. (1) A personal letter from one of the Minnesota Normal School professors gives an account of a four weeks' trip for the specific purpose of visiting and inspecting the work of the graduates of the school. His opinion is emphatically in favor of the plan.

For what classes of schools should Normal graduates be prepared?

From the inception of the American Normal School the principal aim of the work has been (theoretically, at least,) to prepare teachers for the rural schools. Under the topic, "What may the Normal School legitimately demand of those seeking admission?" (See p. 18) attention was called to the tendency of the Normal School to draw away from the rural schools. Graduates of the Normal Schools in the majority of cases become candidates for and secure positions in the city and graded schools. They are well fitted for the primary and intermediate grades particularly. Many of them are country school products, a part only having been through the graded and High School of the city. Who then teaches in our rural schools? Principally those who have completed the work of the same rural schools, had *perhaps* one or two years in a near-by High School, and have managed to procure a low grade certificate. Often they are uncultured and boorish, immature and, possibly, immoral, incapable of elevating and inspiring others to their best development, and are now engaged in perpetuating their shortcomings in the lives of the children before them. Many of these young people are ambitious and desire better things, but the large Normal Schools with two or four-year courses are financial impossibilities. Even the Normal School with the "provisional minimum course" of the Committee on Normal Schools (N. E. A., 1899) is entirely beyond them.

The Normal Institute gives them an occasional taste of the feast of good things possible to teachers who may attend the higher institutions, but the gap between the Normal Institute and the Normal Schools as now sustained

(1) State Normal School Catalogues, Winona, 1900, p. 8; West Superior, 1899, p. 6.

by the different States is too great. It cannot be bridged by many of these rural teachers. What is needed is a middle ground occupied by something within their reach. To meet this the Summer sessions of the Normal School is proposed, and in a few instances are in successful operation. Others have proposed a District Normal School, with a shorter course, say of one year, which by reason of its proximity, and consequent cheapness, and its shorter course, may provide the opportunity for securing more than the Normal Institute can give, even if not so good as the Normal School itself. Support for this view is found in the fact of the larger enrollments in our Normal School from counties near the seat of the institution. It is a serious question, worthy of careful consideration, whether it is not better to establish and sustain a greater number of Normal Schools, of smaller enrollments, and of less pretension. This need is met in part by the private and independent Normals, but would it not be better met under State auspices? Ohio's recent action would support this view.

These two points are freely discussed, and with great force, in the report of the committee of twelve, and elsewhere. (1)

In the operation of the prevailing arrangement of school terms and times of graduation, the graduating teachers come on the market just as city and graded schools are making their selections for the ensuing year. As a result, the majority of the graduates are absorbed by these schools. By the operation of the Minnesota plan, devised by Secretary Shepard, then president at Winona, rural teachers may pursue their studies one quarter at a time, and upon the completion of a prescribed course, may graduate at the expiration of any of the four quarters of the year. Thus many of the graduates come on the market when the rural schools are engaging their teachers, and the city schools are supplied. As a result the rural schools reap the benefits. This in a measure offsets the tendency of the Normal Schools away from a close vital connection with the rural schools, which connection is, in my opinion, an ideal one. (2)

A scheme of Normal School extension is suggested, which is also worthy of consideration. It provides that in whatever place a class of sufficient size can be formed, a teacher shall be provided under State Normal School auspices, and the work so organized and conducted as to lead to definite results which can be credited to the members of the class.

Now it may be argued that all these schemes look toward a lowering of the standards toward which the Normal Schools are rightfully tending. On the contrary, they look toward a further raising of the standards. Maintain a high grade professional school in the State, and with it establish a series of schools which will reach down and take hold of those who are unable to reach even the present standards. These will be feeders to the central higher school. The uplift of the mass elevation raises the lofty peaks still

(1) Report of Com. of Twelve, N. E. A., 1897, pp. 459-60-2-3-4-5-6.
Report of Com. on Nor. Schools, N. E. A., 1899, pp. 858-9-60.

(2) Outline of plan of Irwin Shepard, N. E. A., pp. 582-3.

higher, alway. Let these lesser schools prepare specifically for the rural school work and the higher schools for the graded schools. A plan somewhat analagous to this, though of rather different scope, is in operation in New York, the Albany school being the more strictly professional, and requiring a higher standard for admission.

For the teachers of secondary schools, the college training requirement should be adhered to most rigidly, thus furnishing a wide field for the operation of pedagogical departments in connection with our colleges and universities. A remarkable unanimity in the answers to the questionaires sent to superintendents indicates the growing demand for college trained men and women with the psychological and pedagogical instruction combined with the usual college courses.

The plan outlined would provide for more nearly supplying the need for trained teachers in the rural schools, for the higher professional or graded school teachers, and college bred, pedagogically trained teachers for the secondary schools. Add to these the teachers' colleges as a part of our great universities, and the college professors would find opportunity for professional training that would largely increase their teaching power by reason of better knowledge of pedagogical principles and their application.

Needs and Suggestions for Securing Greater Efficiency.

In looking over the catalogues of many Normal Schools and in visiting the schools themselves, it is apparent that the proportion of male students is very small. President G. Stanley Hall states that in the twelve Normal Schools of Massachusetts there are employed forty-two male and seventy-nine female teachers on the faculties, and that the students numbered 127 males, and 1,642 females. He further calls attention to the fact that in 1901 the graduates of these Normal Schools were divided so that only 7.8 per cent. were males and 92.82 per cent. were females. He asserts further that this tendency is increasing rather than decreasing, and deplores the "feminization of the Normal Schools." (1) I take it this proportion is fairly true for the United States. No one will question that it is desirable that the majority of the teachers in the public schools should be women, but is not this percentage rather too large? Who cannot estimate the value on the development of character, both of boys and girls of the influence of strong, manly men on the teaching corps, particularly in the grammar grades. Grant all that can be claimed as to the value of the women influence—I will agree with the claim—but at the same time hold that there should be more men. I feel, therefore, for the sake of the public school work, that one of the needs of the Normal Schools is more males in the student body. Doubtless the chief reason for this scarcity of men lies in the low salaries paid, but it is also a question whether the Normal School gives that character of training which stronger characters among men desire and demand. Do they get what they feel they need?

(1) G. Stanley Hall, Ped. Sem., June, 1902.

This leads to another point, that of the need of more money for the maintenance of the Normal Schools, but of this we shall speak more fully later.

Another need of the Normal School is a system of competent inspection of their work, not for the sake of securing greater uniformity, though that might result from such inspection, but for the sake of real efficiency in their work. The present system of inspection, in too many instances, is simply a sort of superficial looking over the Normal School plant, and a report on the work, etc., which is simply "whitewashing." (1) What is needed is an inspector, an "outsider," one who is thoroughly competent to conduct or make such inspection, and who is also in a position of absolute independence in every respect. He should have the power and ability to inspect as to the qualifications of the instructors, as to the management and methods pursued, and as to the output, or product of the school, i. e., the efficiency of the graduates. Such an inspection would doubtless reveal many defects, more or less serious, but it would also reveal unexpected excellencies in the work of the Normal Schools, of many of which we are scarcely aware.

Again, I believe greater confidence in the work of the Normal Schools would be felt if there were less chasing after high sounding titles, both of members of the faculties and subjects in the curricula. President Hall calls attention to the use of these terms in some of the courses of study, "which terms," he says, "are scarcely understood by experts in the particular line of work to which such subjects belong." (2) He mentions "Fundamental Principles," "Outlines of Human Knowledge," "Classification, Correlation, and Co-ordination of the Sciences," as occurring in Normal School Courses. Such instances are not uncommon, and indicate a lack of common sense grasp of the real purpose of the Normal Schools. Plain, practical people, students who wish to become teachers in the common schools of the common people, are not in pursuit of extravagant titles. They rather seek to learn more and better how to teach school, and what to give the children in their schools, and when courses of study containing such matter as the above are placed in their hands they receive no help and little encouragement, and the schools so (mis) representing themselves do not secure the confidence of either the general public or of the school people of the country. An avoidance of expressions whose meanings are as yet but little understood and the introduction into our courses of study of those subjects which have a direct bearing on our legitimate work, and which will enlighten and inform those seeking information as to the work of the school will do much towards strengthening the position of the school and the confidence of those whose patronage is desired. Plain, practical, helpful teaching will seldom be found in the classes of the *professor* that lays claim to teaching knowledge of such subjects.

Psychology is also recognized as a legitimate phase of the Normal School professional work. It is the "Blackstone of Education." But it is well to

(1) G. Stanley, Ped. Sem., June, 1902.
(2) Ibid.

keep in mind that erudite definitions of the mental faculties is not psychology. Teachers should know something of the methods of psychological study, by which our psychological knowledge has been gained, and by which they may enlarge their own knowledge as they advance in life. (1) In the Normal School psychology should be based on the hygienic surroundings of the student and the child, such as light, air, heat, posture, exercise, ventilation, as related to buildings, rooms, hours and kindred elements. It should also include an ability to examine and note abnormal and defective senses of the individual, and refer the treatment of the same, when required, to proper medical or other authority. Primary teachers should be good nurses. This implies no degradation, for the trained nurse is an artist of a high order of merit. Our Normal School psychology should also know something of the laws of muscular and nervous activity, the value and place of drill in the formation of habits, the influence of habit in education, the place of play in the development of the child and the animal, and how to estimate the strength of the tendency towards imitation in the child and the consequent value of example. It should also include a knowledge of temperaments of children and teach something of the varying traits and tendencies which govern the different temperaments.

The play of the emotions in child life is exceeding strong, and the Normal student should receive instruction here. Also should there be something of the study of the will if we would render the study of psychology reasonably complete. Then what should be said about introducing something of the force of heredity and the power of environment in the development of the child?

All these constitute the heart of psychology for Normal Schools. They are the keys to all true practical psychology. (2)

Pedagogy is naught but applied psychology. (3)

Such psychology would teach the graduate of the Normal School that the child is a different creature than the adult, and that he demands more of the substance of knowledge and less of the form and method. Excessive analysis, the dissection of large living wholes is contrary to child nature. He sees the large wholeness of things, and it is but stultifying the child to force him to the slower pace. He is enormously receptive and capable of receiving much that is to be apprehended later. The following quotation is literally true: "The weary moralizations of pedagogical rudiments, the arid wastes of *short steps, easy methods* and *logical sequences*, represent more often the second childhood of senility in knowledge than the golden dawn of childhood with its powers of divination," a power which we (grown-ups) have lost. (4)

Time and space will not permit more on this line, though it is important,

(1) Ellis, Normal Sch. Course in Psychology, So. Ed. Assoc., 1901.
(2) G. Stanley Hall, Ped. Sem., June, 1902.
Nicholas Murray Butler, in the same.
(3) Ibid.
(4) Ibid, pages 180 *et seq.*

and there is much that might be said both of interest and value. The authorities quoted above will give much material for serious thought.

VI. Observation and Practice Schools.

It is an aphorism that we "Learn to do by doing," hence the importance of a training school department in which the theoretical instruction may be crystallized in practice.

Inasmuch as the child is the pivotal center of all educational effort, the training school is the focal point of Normal School organization and function. (1) All other departments should relate to this as the center. In this should the theories taught find practical illustration. Often the relation is not one of unity but of duality. The training school is often too near a separate institution. The heads of the departments often know very little about the actual work carried on in the training school. The one teaches Hegelian doctrines and the other practices those advocated by the disciples of Herbart, or if not these, other equally variant views are taught and practiced in the one Normal School. (2) This is not as it should be. If the departments present certain ideals, the training school should endeavor to measure up to these ideals. If the student is to teach under criticism in the training school he should be furnished by the departments with the standards by which his work is to be measured. Unity in plan and co-operation in execution are essentials. Without this the institution shows itself less an organism centering in the performance of a fundamental function, and more a mere mechanism which, while its parts may co-ordinate with apparent nicety, does not possess that vitalizing unity of an all-pervading spirit which makes for efficiency.

From a standpoint of control the training schools appear to be of four kinds:

1. The school wholly under Normal authority; in which the course of study, the direction and management, are all under the direct control of the principal of the Normal School, or a member of the faculty, usually known as the principal of the training school.

2. The school under divided authority; the course of study determined by the city, the practice work of the student teacher being under the control of the Normal. The expense is shared by both.

3. The training wholly independent of the Normal authority; the course of study, methods followed, results to be secured, all determined by the city. The Normal students simply serving as assistant teachers, their work being inspected by the regular teachers and city inspectors.

4. The school which under independent control, permits Normal students to serve as apprentice teachers under the advice and assistance of the regular teachers according to the plan of the critic teachers of the Normal

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(1) John W. Cook, Discussion, N. E. A., 1895, p. 716.
(2) Mace, Central Defect of the N. S., Ed. Review, Feb., 1901, pp. 137-8.

School. (1) The apprentice system as followed at Worcester, Mass., is fully discussed by Gordy, described by Marble, and referred to by others. (2) It is generally well understood and need not be discussed here at length. In De Kalb, Ill., the Normal School furnishes seventeen rooms, part used for recitation purposes, all for the accommodation of about 350 pupils of the city schools. Of this number there are about 120 belonging to the first four grades, eighty to the fifth and sixth, and 160 to the seventh and eighth grades. The city of De Kalb has about 1,200 school children and three buildings owned by the city. All of the seventh and eighth grades attend the department in the Normal School building. The city superintendent is a member of the Normal School faculty. Part of the senior class does practice work in the Normal building, the others in the schools outside, but all under the supervision of the critic teachers. Dr. John W. Cook, to whom I am indebted for the statement of the plan, in a personal letter, says further:

"They are very closely supervised. Not only do our critic teachers observe their work both in the normal building and elsewhere, but Dr. McMurray, the supervisor-in-chief, does the same thing, and each member of the faculty has his work so adjusted that he can follow the work in the practice school." Again he says: "These student teachers are thus put into exactly the same kind of work and with the same degree of responsibility that they will be obliged to undertake when they go out into the public schools as teachers. Of course this is rather severe on them, but it is really wonderful to note their success." "There was considerable opposition," he says, "on the part of the town before our idea had been tried. That opposition has disappeared almost entirely."

In other portions of his letter, President Cook emphasizes the practical character of the plan. As to its expense, the number of teachers employed by the city is diminished and an increase of salaries, amounting to about fifty per cent. for those employed, has resulted. The saving to the city in the first year was between $2,000 and $3,000. He speaks of the work as an experiment, but one which by reason of its success will be continued. (3) There certainly is an appearance of real practical conditions which do not appear to prevail in a majority of the training schools of the country. The plan is worth careful study and further trial.

In Oswego, N. Y., Principal Sheldon, for over thirty-five years conducted his practice school as one of the public schools of the city, subject to the same supervisions and tests as the other schools of like grade, and found that it had always sustained itself honorably and taken high rank with these schools. (4)

(1) Stout, Training Schools, N. E. A., 1895, p. 702.

(2) Gordy, Rise and Growth of N. S. Idea in the U. S., Bureau of Ed., 1891, pp. 76, 89.
Marble, Discussion, N. E. A., 1891, p. 521.

(3) Personal Letter from President John W. Cook, De Kalb, Ill.

(4) Sheldon, Practice School as a Public School, N. E. A., 1896, pp. 656-7-8.

The New Hampshire State Normal School, located at Plymouth, reports that "The school system of the village, carefully graded through a course of twelve years, is under the control and direction of the Normal School for model and training schools." (1) In the Normal Training School at Terre Haute, Ind., the children belong to the regular grades of the city schools. (2)

In looking over the plans now in vogue, and keeping the replies to his questionaires in mind, the writer is brought forcibly to the conclusion that much—too much—of the training school work is artificial as to its conditions, impractical as to its methods, and inefficient as to its results. The plan followed in De Kalb is apparently more in harmony with natural conditions, more varied and practical in its methods, and, we believe, will prove more efficient when the results come to be tested in the crucible of experience. The same appears to be true of the Plymouth, N. H., plan, and I apprehend that the wide reputation attained by the graduates of the Oswego, N. Y., Normal School may be attributed, in a large measure, to the practical character of their training school work. All of this argues much in favor of that training school which presents most nearly the conditions of actual school work into which the Normal graduate must enter.

We recognize that the schools of the community in which the Normal School is located are often non-available, either by reason of distance, or the unwillingness of the community. Other causes may operate to prevent the attainment of the relation, and thus the Normal School authorities are forced to establish training schools under conditions more or less artificial. In such cases the best possible must suffice, but until a more practical training school is secured, the student-teacher must expect to find actual conditions far different than those under which he has been working. He will find from forty to sixty real, live, active boys and girls before him, and no critic teacher or supervisor with wise counsels within reach or call. All responsibility is upon him, and that for five full hours each day. Then comes the test of character and power. Methods and devices without developed resourcefulness prove but a poor dependence.

In the further consideration of the training school phase of the Normal School problem, we observe a small but influential group of men and women who urge the division of the work of the training department into two distinct divisions, both as to time and the character of the work to be done by the student-teacher. I refer to the division suggested at the head of this chapter, Observation and Practice Work. (3) The former contemplates a school conducted by experienced teachers who have attained positive success in conducting public schools. The work done here is to all intents and purposes, *model* work as far as any work can be that. The student-teacher is required to spend much time in the observation of this work, that he may know by actual contact what qualities a successful teacher possesses. It is

(1) Catalogue N. H. State Normal School, 1899, p. 41.
(2) Catalogue, Indiana State School, Terre Haute, 1900, p. 32.
(3) Report Com. of Fifteen, N. E. A., 1895, pp. 240, 244 ff.

not that the student should observe that he may imitate. Imitation is the bane of school work when it becomes slavish copying of mannerisms and devices. The instructors in the various departments, particularly those in psychology and pedagogy, and the director in training, must permit the habit of mere imitation to gain no foothold. The instruction in the fundamental principles of methods should be so thorough and complete that the observer will see in the admirable work before him but the working of those great principles with which, in his study, he is gaining an acquaintance. Reports upon the work observed, discussions of the plans and methods of teaching should be had in class, and also in personal interviews with the critic teachers and director in training, all calculated to develop the power of correct observation. Many a teacher looks at splendid work, oftentimes with eyes that do not see, simply because they have never been opened and trained to see. Whether in business, mercantile, or professional life, as well as in the arts and the mechanical trades, the power of close discriminating observation is the mark of the most successful man. Nothing seems to escape such men. So it is in the teaching profession; he who would be great, even in the small things, must be able to look with eyes that see. Hence the emphasis laid upon this point in the discussion. (1)

After the power of correct observation has begun to develop, the work of actual practice should begin. This should be in a separate school; at first for but a short period of class work, later for a longer period with added degree of responsibility as regards discipline. We say it should be a separate school from the first, because the model character of the former must not be endangered by apprentices. To preserve the model character of the observation school the regular teacher who is an expert must be untrammeled. Her work must be kept intact. The practice school is to be one in which while the practice work is being done there, the supervision by the critic teachers and the director will prevent any serious injury coming to the children by the mistakes of the pupil teacher. However, if the observation work has been properly assimilated, there will be comparatively few mistakes to prevent or correct.

At the same time the children will not be so artificially conformed to the custom of the Normal School training that they will be prepared with the proper response before the call is made. A pupil teacher in a well-known Normal School in the process of a certain line of development in fractions, became a little confused and hesitated as to the next point. She had the matter well planned and the plan had been approved, but for the moment *the next step* had passed from her mind. One of the lads, "who had been there," was very quick to note the confusion and supplied the proper question. He was also "loaded" with the answer. This incident occurred in a school in which the training school served for both observation and practice. This leads to the thought that the plan of writing out a plan in advance and

(1) Miss Stout, Training Sch. and Practice Tchg., N. E. A., 1895, pp. 704-5. Also McVicar, Discussion, 1896, p. 665.

having it approved may be continued too long. At the end of four or five months, says Miss Stout, when the pupil teacher exhibits a due appreciation of the importance of careful preparation, and has exhibited considerable ability in the arrangement and classification of subject matter and in the method of treatment, it is well for him and for the class to break away from formal plan writing. Independence and originality will result and that spontaneity which means life, will characterize the work of both teacher and pupil. (1) It seems to me that the training school should be thus segregated, providing for observation of skilled work first, and for practice under wise supervision later. Here lies one of the critical points in our Normal School work. Not only do those who replied to the questionaires convey this idea, but I find it freely urged and discussed in divers forms in the literature which bears on this general topic. (2)

The position of the critic teacher is one of highest responsibility. Upon their fidelity and good judgment depend in a large degree the efficiency of the training school and its after influence upon the Normal School graduates. In replying to No. 6 of the questionaire, 41 per cent. of the Normal School presidents believe that the tendency of the Normal School is toward "higher excellence in the critic teachers." They further urge a thorough practical experience, combined with training in theory.

In discussing the equipment of the Normal School faculties (pp. 8, 10, 11, 13), certain strictures were made on the faculties in the Normal Schools. These criticisms would apply in an increasing degree to the critic teachers, insofar as they fall short of ample experience, broad scholarship, academic and professional training, and that skill and tact in inspection and counsel that should be their peculiar qualification. The selection of directors-in-training and critic teachers therefore becomes of prime importance and only the best should be placed in these positions.

The Normal School graduates themselves recognize this fact. A large proportion of those replying urge the employment of "experienced and cultured critic teachers." If, then, the greater stress be laid upon the work of the training department of the Normal School work, as being the department in which the teachings of other departments are crystallized and applied, and if the success of the training school depends almost wholly on the skill and ability of the critic teacher, how well founded the plea of the Normal presidents and the Normal graduates that in this department, more than in any other, only *the best* be placed. High salaried heads of departments and low salaried critic teachers is anything but good economy. It were better to reverse the order if high salaries be not permitted both.

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(1) Miss Stout, Training Schools and Practice Teaching, N. E. A., 1896, p. 705.

(2) Hall, Rein's Practice School, N. E. A., 1896, pp. 647-8-9.
Sheldon, Practice School as a Public School, N. E. A., 1896, p. 658.

VII. Training for Secondary Schools; Pedagogical Departments in Colleges and University; Teachers' Colleges.

If the opinions expressed by the superintendents and other observers of the work of the Normal School graduates be credited at their face value, and in the opinion of the writer the situation justifies all they have said, the Normal School, prepares best for the rural schools, and for the primary and graded school work. It is not to be denied that many successful principals, superintendents and High School instructors have been produced by the Normal Schools of the country, but the fact still remains, as stated elsewhere, that the great need is for graded and rural school teachers, and the greatest success of the Normal Schools lies along this line of work. Granting this then as the scope of the Normal Schools as now organized, it remains to discuss briefly the means for preparation for secondary and higher schools.

"The peculiar function of the secondary school," says Dr. Russell, "is the selection and training of leaders for intelligent service in academic, professional, and industrial life." (1) The secondary school is the college of the common people, or the masses. In no class of schools is the need for the best teaching ability more imperative and necessitous. Here, if anywhere, should the teacher be fitted by nature and by training to discharge his duties in the mcst skillful and efficient manner. Here are developed the leaders of the people, not in a national or State-wide sense, but in the community life in which are generated these mighty influences which ultimately reach and affect our Stato and National welfare. The teachers in these schools should be men and women of strong character, high culture, magnetic temperament and peculiar power to impress rightly the budding manhood and womanhood about them.

The period of adolescence is a very critical one, and the character of the future men and women is largely determined by the influences thrown about the boy and girl at this time. These teachers should possess to a high degree, not only general professional and special knowledge, but also power and skill in teaching. (2) Heretofore the college trained individual has been deemed the proper person for High School teaching, and we still hold that college graduation should be rigidly demanded as the measure of scholarship qualification for those positions. (3) But this alone is not enough. Their methods should be correct and in line with the best of modern thought. The High Schools are at present an important source of supply for teachers in the rural and graded schools. The kind of teaching done in the High School should be such as to inspire the pupils with right ideas of the dignity, the importance, and the character of the teacher's work. Hence, again, the importance of having only trained teachers in the secondary schools. But where may this training be had. It is not given college-bred men in the

(1) J. E. Russell, Training of Teachers for Secondary Schools, N. E. A., 1899, p. 285.
(2) G. S. Hall, Youth's Companion, Sept. 10, 1903.
(3) Report of Com. of Fifteen, N. E. A., 1895, pp. 249, 250.

Normal Schools; they will not attend them. If the training can be given them along with their college course, well and good.

Here, then, lies a field of work which comes legitimately within the scope of the pedagogical departments and universities. This does not imply that the methods of teaching practiced by the college professors are the proper models for those who would teach in the High School, for such an idea is incorrect. The High School method of teaching is altogether different in aim and plan from that of the grades on the one hand and the college on the other. It is unto itself, and the training should be specifically adapted thereto. Professors of Education in our college faculties should therefore have had experience in secondary teaching, that their instruction may be in harmony with the needs and conditions of the work for which they are preparing their students in the pedagogical department. This should be combined with the requisite broad scholarship belonging to the college faculty.

Another element of strength in any college faculty, regardless of the fact that their students are to become teachers, is a professional training for teaching on the part of the members composing that faculty. I think that some of the most unpedagogical work that is seen in any class room anywhere may be observed in the recitations conducted by scholarly college professors, strong in research work and as investigators, but miserably weak as teachers, simply because they do not know *how* to teach. Even college professors should be trained teachers, and this paves the way for the position that in our great universities where the college professors for the future are being developed, a part of that development should be attained under the influence of distinctive work in *Education*, such, for example, as is offered in teachers' colleges of the rank maintained at Columbia University.

In other words, teachers of any school, rural, graded, secondary, college or university, should have a professional pedagogical training as an essential part of their equipment. If this be accomplished, the entire system of schools throughout the land will be professionally conducted and taught to the ultimate advantage of every student in every school in the United States. (1) Our university pedagogical departments and the teachers' colleges must address themselves to these problems if they would cover a highly important field, demanding, never so strongly as now, that it be intelligently and thoroughly investigated.

It is not within the scope of the Normal School so much as it is within that of these departments of pedagogy when properly conducted. The conditions of pedagogical study in the university are of the best, and the facilities there are greater than elsewhere. The establishment of such chairs seems to be in compliance with the demand that the college graduate who would teach must be trained to do his teaching well, and in accordance with well established principles of teaching. (2) That this is true, we note the

(1) J. E. Russell, Training of Teachers for Secondary Sch., N. E. A., 1899, pp. 295-6.

(2) Hinsdale, Pedagogical Chairs in Colleges, N. E. A., 1899, pp. 562-3.

fact that out of 436 colleges and universities reporting to the Commissioner of Education in 1898-9, 220 reported courses and departments in pedagogy. (1)

The teaching profession needs better and stronger men and women.

The profession of teaching needs the strength and dignity which university recognition will give it; and when this is given, as it will be, the added dignity of the profession will draw the best of our brainy men and women into its ranks, and a higher appreciation of the work of teaching will be established in the public mind and conscience. (2)

VIII. The Future of the Normal School—Scope and Efficiency.

What as to the scope and efficiency of the Normal School in the future? Who can tell? From the inception and establishment of the Normal Schools in this country there has been a constant tendency upward towards greater efficiency in the scope of their work. That the progressive spirit is gaining in strength each day cannot be doubted. That there has been an increasing determination towards better things is likewise true. Nor is there any question but that the future has rich promise of greater good. This will be worked out by the brain and effort of the strong workers now in the field and others still to enter.

Some directions in which this effort will be exerted have been suggested in the replies to the questionaires and in the literature consulted, and therefore included in the opinions offered in this study.

1. Shall we eliminate the academic branches from the Normal School course and make the work strictly *professional?*

No. Even though the secondary schools supplied the Normal Schools with pupils of advanced grade and in sufficient numbers to fill the classes, the review of the academic subjects from the teacher's point of view would still constitute one of the valuable features of the work. To teach these branches as they are taught in the lower schools is incorrect, and such duplication would be unwise, but it is the part of wisdom and economy to teach them professionally, i. e., from the teacher's standpoint. William T. Harris says that the American Normal School has taken up just this work of review from the beginning, and has performed it well during the entire sixty years of its existence. (3)

2. Is there room for a more practical adaptation of the means to the end—that of fitting teachers to teach school?

Yes. Less of wild theory, more of practical common-sense methods. Fewer worshippers of devices, and a more comprehensive grasp of the great underlying principles of methods in education, and an adaptation of the methods of teaching to them.

3. Is the Normal drawing away from the rural school? Yes.

Will this tendency be counteracted? How?

(1) Hinsdale, Training of Teachers, Monograph in Butler's Education in the United States, 1900, Vol. I, p. 406.
(2) Hinsdale, Ped. Chairs in Colleges, N. E. A., 1889, pp. 560-1, 563-4.
(3) Harris, The Future of the Normal School, N. E. A., 1899, p. 398.

We must prepare teachers for the rural schools. This is vitally fundamental. The State certificates teachers of comparatively low qualifications. We cannot deny such the privilege of receiving instruction as to *how* to do that which the State authorizes them to do. Therefore the standard of admission to the present Normal Schools must be kept within the reach of students of such qualifications, or provision must be made for giving them the desired training. This may be done by means of Summer sessions in the existing Normal Schools, or by the establishment of district Normal Schools with shorter courses and more elementary work, or by means of Normal extension classes wherever such classes may be properly demanded and organized. Some such plan will meet the requirement of preparing the less highly qualified teachers, and permit the existing Normal Schools to follow the demand for a higher class of work and to require higher qualifications for admission, thus meeting the requirement for training those who have enjoyed secondary school training before seeking Normal School training.

4. Is it possible to make the training schools more practical by conforming them more nearly to the conditions prevailing in actual public schools? Perhaps not in all cases, but it has been done repeatedly, and with entire success. The relation between the Normal School and the local school should be one of entire and cordial co-operation. This being accomplished, the saving financially to the local school will appeal strongly to the taxpayers and the management of the schools. The many years' experience in Oswego, N. Y., and Plymouth, N. H., and the more recent success in De Kalb, Ill., prove the feasibility of the plan. I believe there is a waiting opportunity for improvement in this department of our Normal School work, and further believe that the plan suggested will, with modifications to suit the local conditions, be more generally followed.

6. Is it better to secure faculties, including critic teachers, of wider experience and better acquaintance with the needs of the public schools, and therefore able to more intelligently prepare students to teach therein? Yes. Establish fewer departments, employ more experienced men and women, of equal training professionally with the best now employed. This can be done with the same money as is now being expended. As much as the science of education should be exalted, together with all that it implies, it can never be done at the expense of all practical experience in the school room. In the opinion of the writer, the employment of men and women possessing only a theoretical knowledge of the teacher's work is worthy of condemnation.

Much of the impractical, visionary, inefficient work of Normal Schools is directly attributable to this fad of having on the faculty those who bear the stamp of "Made in Germany," and who too frequently are full of ideals entirely beyond the possibility of realization under the practical conditions prevailing. Give these same high titled individuals an experience of a few years in the schools for which they seek to prepare teachers and the combination of theory and experience will make a most valuable and efficient addition to the faculty. I know this sentiment will be condemned, perhaps unsparingly,

by those who employ this material, but the hard-headed practical superintendents of city schools are fast coming to appreciate the truth that lies behind the thought. Theory is good, experience is better, and the combination of the two is infinitely best.

I seek to express honest opinion here—opinion not alone my own.

I do not condemn the study in foreign schools and the pursuit after advanced degrees. Far from it. But I do insist that the seasoning influence of experience shall enter into that timber which inspires to the lofty position of *teacher of teachers.*

6. Is it possible that the Normal School president can be relieved of the multifarious duties now resting upon him and which are outside the legitimate field of his work, and which prevent his giving his whole heart and soul to the real work of his school? As at present organized many Normal School boards of control expect their presidents to "work" the Legislature for liberal appropriations, act as purchasing agent, as cashier and auditor, and to manipulate the entire machinery of the school. At least, they permit him to do so. He is made to serve as administrative pack horse, carrying the many burdens of affairs without as well as within the school. How can a man, even though a Hercules, perform such labors without fatal neglect of the most important function of his great work, that of maintaining a living contact with faculty and students, sensitive to their every need, and breathing into the entire organism the breath of a pulsating, lasting, vigorous inspiration to do the utmost for the children in the schools of the State. If the ultimate interest of the child is not felt as the central purpose of all the work, there is a woeful lack somewhere, often in the inability of the president of the Normal School to perform his first great duty first, owing to the fact that the material and extraneous affairs demand his first attention. The question presses: Should the president be thus relieved, and can it be done? I am confident it should, and believe it can.

7. Should the number of the Normal Schools be increased, and the individual enrollments be diminished? Yes. The number of graduates each year is about one-fourth the annual demand necessary to maintain the supply. About 40,000 of the over 400,000 teachers employed in the United States, retire each year. The number employed is steadily increasing, owing to increase in population. The Normal Schools, public and private, graduate about 12.000 annually. (1) Should there be more normal schools?

The enrollment in some of our Normal schools runs into the thousands, with faculties of fifty and more instructors. Many of the students enrolled are not Normal pupils in a strict sense. Much teaching of a miscellaneous character is done at the expense of legitimate Normal work. In Prussia, the Normal School enrollment is usually less than one hundred, with a faculty of nine professors, including the two in the practice school. We may gain the enthusiasm of numbers, but we lose far more in lack of close personal touch with members of the faculty. This is a serious loss, which is not com-

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(1) Hinsdale, Training of Teachers, Butler's Ed. in the U. S., vol. I, pp. 376-7.

pensated by the gain in enthusiasm. (1) Individual acquaintance with the student is secured in the smaller classes, and with that acquaintance comes a knowledge of needs which enables the instructor to meet the requirements of the individual student. The eminent German critic, Dr. E. Schlee, in an address delivered in 1893, said, "We have come to the weakest point in the American school system—professional teachers are wanting." (2)

As a rule, the student educated in a Normal School with a small enrollment is better educated, particularly along professional lines. It is urged by many that individual instruction be given to as great a degree as is possible. Large classes render this well nigh impossible. Professional training of the individual is therefore so imperfectly accomplished that the unsatisfactory character of the Normal School product is perhaps the result naturally to be expected.

8. Can the work of the heads of departments be so arranged as to permit these men who outline the ideal methods of teaching to follow the work of the pupil-teachers in their practice as they endeavor to work out the outlines presented? This cannot be done in the schools of such large enrollments, in a way sufficiently definite and personal to be of real value to the student teacher. With smaller enrollments it could be done with the best of results. It appears from the answers to the questionaires that the failure to co-ordinate the instruction received with the practice work required by the supervisors of the training school throws the student oftentimes into a condition of considerable uncertainty as to what to do. The principles enunciated by the instructors are not applied in practice and much valuable time and material is therefore lost to the student.

IX. Conclusion.

The eight interrogatories under VIII, together with the answers there given embody something of the conclusions to which we seem to have arrived. By way of a general conclusion to this study, as to the scope and efficiency of the Normal Schools of the United States, and in the light of the history of the past sixty years, and its lessons, we may safely assert:

1. The original purpose of the founders of the Normal School system was grand in its conception and courageous in its execution. The difficulties were an unknown element, but they were met wisely and with signal success.

2. That purpose was to train teachers who would be competent to teach the children of the people. For no other purpose will the public support the Normal School.

3. This purpose has remained the one proper aim of the Normal School to the present day. To this we must remain loyal. To depart therefrom means utter failure.

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(1) Hinsdale, Ibid, p. 378.
(2) Quoted by Hinsdale, Ibid, p. 405.

4. The separation of *academic subjects* and *professional study* is false pedagogy and unsound educational practice. The teaching process cannot be separated from the subjects to be taught. The abstract is apprehended only by association with the concrete. Nor can these subjects be studied professionally except as they are studied in immediate relation to the teaching process as applied to them.

5. The processes of teaching thus associated with tne subjects to be taught rest upon great fundamental principles, as old as the race, and as unchangeable as human nature. The study of the history of education and of psychology is therefore essential that the teacher may grasp the great principles of the past and know the laws of the mind which he seeks to educate and develop to the utmost of its powers.

6. Teaching is a fine art. The finest of all human—if it be but human—arts. Based upon the fundamental principles which constitute the science of education, the observation and practice schools are essential to the attainment of the skill which constitutes the teacher and artist of artists.

7. Only a *master* is capable of instructing, developing and training an artist. Therefore only those who are proven and tested, and who have attained mastery in actual practical experience, should stand before us as a teacher of teachers.

8. The one pivotal center is the child. All the plans and purposes, the principles and the processes, must cluster about this one point of the child and his development. The ancient Greeks taught, "Man, know thyself," but the *man* was first a *child*. Therefore we teach, "Teacher, know the child."

Therefore, and finally, in the accomplishment of these, the ideal product of the Normal School should be of good physical powers and development, of high aspiration and character, and of mental equipment, which includes (one) General knowledge, as broad as can be secured, always beyond that of the members of the school; (two) Special knowledge, of child nature, and of the subject matter to be taught, thoroughly understood and ready for immediate use; (three) Professional knowledge, embracing the principle of education, and how to apply them to the work in hand, and a study of the child from the standpoint of the teacher's relation to him; and (four) A Skill in Teaching, made up of natural inclination and ability, and one acquired ability resulting from the possession of all that has gone before.

It is true that sixty years have witnessed great things in what the Normal schools have accomplished, but let us not rest content with present achievement. The future is bright with promise; it remains for us to wrest its great fulfillment.

All of which is submitted, with the hope that out of the large amount of material collated, something of real value has been gleaned.

CO-EDUCATION AND THE RAW MATERIAL OF THE SCHOOL.

By Melanchthon F. Libby.

The vulgar saying that you can't make a silk purse out of a sow's ear has a grave significance for pedagogy. Hopeless deficiency in the raw material absolutely forbids the expectation of the best class of finished products. Now the raw material of the schools in this country is not hopelessly deficient, it is not even bad, it is good; perhaps a critical estimate, after considering the quality of the founders of Colorado and later comers, might fairly call it comparatively excellent. It is not merely as a local problem, then, but as a general educational problem, that we would glance at this matter of raw material in teaching.

There are many definitions of the purpose of education from the point of view of the individual, as well as from that of the State, but all views agree that cultural and practical efficiency are the ever-present ends of the teacher in relation to his students. When a piano maker aims at making a high grade piano, he selects superior woods and metals, and so analogously the farmer secures the best seed, the democracy the best representative, and so on. In a few schools where circumstances permit rejection of applicants, the raw material is selected, and with gratifying results. But in general, under a popular system the teacher must take the material that offers and make the most of it, and it is unquestionable that this is not only practically best, but also that there are positively good aspects of this state of things which need not be enlarged upon here.

There is no question, then, of improving the raw material of our public school system by restriction. And as no other means has occurred to any one, this has been regarded as the hopeless problem of pedagogy; and if a teacher has occasionally called a pupil "blockhead," or "stupid," or "simpleton," he has later criticised his own irritation and fallen back upon the simple platitude that natural incapacity is neither his fault nor the pupil's. Indeed, the questions concerning raw material are seldom thought of seriously, and the current literature of pedagogy is singularly free from any preoccupation therewith. Oliver Wendell Holmes jokingly advises aspirants to fame to secure proper ancestors. Spencer and others have touched upon human selection as possibly bearing the same commanding position in human affairs that selection holds in the animal and vegetable provinces, but only to set it aside as a fruitless topic.

Hence accordingly, and in spite of the two or three articles that have appeared from time to time by enthusiasts, the subject has never become a question of practical pedagogy nor even of serious speculation. In Rousseau's *Emile* the youth's courtship and marriage are more or less controlled by his tutor; in Shakespeare's *Tempest* Prospero declares that his artful management of the meeting of Ferdinand and Miranda is the greatest of his acts of scientific magic, but it must be clear to all that the reign of law does not yet extend to this vital matter and that though science daily takes new affairs out of the realm of passion, opinion, prejudice and caprice, it cannot tamper with this most delicate topic.

Nevertheless, there are two volumes in the whole theory of Pedagogy and not merely one. The first of these logically is the volume of raw material, and the second, that of manufacture. The first deals with *Heredity*, and the second with *Environment*. There are two kinds of difficulties for educational theory, and just as improved methods of education remedy the evils of bad training, so nothing but improved methods of selection can improve the raw material. *Selection is to the kind of pupil to be trained what method is to his training.* Even to have it clearly established that this first volume of theory must be investigated and brought up to a state of scientific law, would be a gain. Either this is the ideal logically, or else we must discard the idea of a complete scientific pedagogy. The great conception that education is the conscious evolution of the race is meaningless unless the race can be controlled by scientific knowledge *at its source.* Even the scientific ideal of control would be shorn of half its meaning if it were confessed that this control could never affect the raw material of humanity. The very impossibility of the thing as it appears to us at the beginning of the century gives it a certain charm when we think of the energy and resourcefulness of the recent past.

It may be well to recall clearly that any attempt to touch this question practically could hardly occur to a less enthusiastic theorist than Rousseau. The tutor as controller of selection, if suggested by one of less genius for humanitarian problems, would offer opportunities for the comic paper. Not only would the victims resent such interference, but the tutor would be equally reluctant. In France, before the Revolution, of course there was plenty of interference and the spiritual guides no doubt often indirectly exerted influence, though never on evolutionistic principles. A little reflection will show that this subject must be approached very indirectly. No frontal attack will succeed, it would be repulsed with loss, indignity and ridicule. But scouting is always in order, and a little scouting reveals a great deal.

Before any theories can be thought of, it would be wise to ascertain by prolonged research, just what are the grounds of selection. This research presents vast and probably insurmountable difficulties at the outset. Nevertheless, much has been done already which could be used to lighten the labor. The problem has been dealt with by many who have had no interest in pedagogy. A superficial study will show that there are innumerable factors at

work leading to selection and that the complexity of motives in man is in this respect great as compared with that of the motives in lower animals about in the same ratio as his environment and response are more complex. The standard works on marriage do not throw much light upon this aspect of the matter. (1) Romantic attachment in a sliding scale of sympathetic attraction, (2) wealth, (3) social status, (4) convenience in domestic arrangement, (5) propinquity, (6) sympathies in occupation and intellectual interests, are among the obvious causes of selection. But there are endless intricate conditions such as the limited number of acquaintances, difference of caste, family misfortunes or taints, that interfere with the simpler motives. And then, again, the mere fleeting aspects of fashion and taste are often quite powerful. A clever painter in Paris may glorify the red hair of his model and thus indirectly affect selection; a Du Maurier or Gibson may improve the attractive powers of a whole group and correspondingly depress those of another. The fashionable play or novel, or even the prevailing mode of hair-dressing and costume favors some at the expense of others, and a whole research might profitably be directed toward these minor modifications of selection.

With such a preliminary study would be connected a thorough consideration of the influence of co-education in this direction. Often great movements begin unconsciously and mysteriously in the most unexpected ways and possibly our school systems have already gone far ahead of theory in the direction of pedagogic control of selection. It is true that not many marriages seem to result from co-education. But this is surely a superficial matter. *The insight into men and women gained by constant class-room and college-town experience must deeply modify the judgment and tend to raise the better kind of men and women and lower the others in the estimation of each student.* It is inconceivable that all this co-education is not a training of the judgment for selection. Ruskin asserted that a man should know a woman seven years before marrying. This demand is extravagant, but we are fast reaching the point when a man has a better opportunity of knowing something about the best qualities of women, through years of observation of their moral, mental and general equipment.

This reflection leads naturally to the next phase of the general discussion—what is society already doing to control selection, if not scientifically at least in a manner consistent with the wisest opinion of the race? And the answer to this question is so encouraging as to put the whole matter in a more favorable light.

The home, the church, the school, society in the narrower sense, legislation, art, literature, commerce, amusements, in a word, every factor in civilization when separately examined will be found to be modifying selection all the time, and offering to the scientific inquirer a mass of observations which do not in all cases resist some attempt at classification.

Indeed, at this point in the consideration it becomes very dubious whether pedagogy as such is alone or predominantly indicated as the controlling force of human selection even in an advanced stage of civilization;

though it remains probable that the department of university activity which has appropriated child-study and is attacking the study of adolescence will work out finally a complete ethology and end like the novel, with marriage, thus (doing consciously what the true romance has done instinctively), making selection its true goal.

In conclusion, then, we may be said to arrive at certain principles as results of this outline.

1. That in theory a science of pedagogy should deal with raw material as well as with the fashioning of raw material.

2. That this problem is not to be considered outside practical issues simply because the teacher can never hope to interfere in selection in any direct way.

3. That every movement of the time and most of all co-education offers an indirect but powerful means of just such interference as the improvement of raw material demands.

4. That there is even now a great need of careful investigation of the causes affecting the production of educational raw material.

5. Finally our study emphasizes what we all need more or less to realize, that the teacher must not morbidly assume responsibility for inherited faults and defects in his pupils, at any rate to such a degree as to depress his spirits and usefulness. Most of the criminals and lunatics of the next generation are now in our grade schools, and examination might show that their numbers are approximately equal to those of the incorrigible material over which so many good teachers are inclined to worry too much.

FACTORS IN THE LEARNING PROCESS.

By Joseph H. Bair.

With the advent of the theory of evolution, which brought with it a wide range of problems, came also again the necessity of reconsidering many problems which have received the dictum of the past. In the light of it all history had to be rewritten. With it came the biological sciences with new meaning and increased importance. In it the genetic problems had their origin.

With evolution came the study of structure and function, as well as of processes involved. During the last quarter century our literature has become bountifully enriched by those who have investigated the problems of life, and worked out the laws of variation and heredity. Hoary headed opinions and dogmas were put to the test of experiment and criticism, and have lost much of their former sanctity. Men began to realize the importance of getting their knowledge from nature first hand, and Rousseau's doctrine that we must become good observers is receiving full inspiration.

The outcome of this movement toward observation and the investigation of the principles of knowledge and truth is, that its portals have become less guarded by a dark phraseology which to the multitude is a foreign tongue. Men are becoming less interested in works of fiction, and turn to nature, and to books which have their origin deep in the principles of our nature. The experiments of science are no more mysteries and for but a few privileged eyes. Science is leaving her retreats, her selected company of votaries, and with familiar language is beginning the work of instructing the race. By means of the press, discoveries and theories once the monopoly of philosophers, are now scattered broadcast among the mass. Laborers are beginning to understand the principles of their art, and are able to explain the laws and processes which they turn to account.

Darwin has discovered the world as a great laboratory in which all may be observers. This new view of the world has inspired many laboratories, where nature is obliged to give up many of her secrets. In the laboratory conditions can be produced arbitrarily and consequences noted and thus law discovered. The laboratory, consequently, has become the *sanctum sanctorum* of those who would know the truth andd understand the order of things. History, too, may be regarded as a laboratory, in which the experiments are already made and the conditions and results recorded by the historian. All that is left for us to do is to work out the results. These results, as far as ascertained, betray the facts of evolution, and portray the laws of progress.

Even the human body bears marks of its own historical development which in the light of the facts of history and experiment can be easily explained.

It has become imperative for the psychologist and educator, in order to improve educational methods, so as to facilitate progress, and to find solutions for the great problems confronting them, to be well acquainted with the physiological workings of the bodily organism, as well as with its historical development, and the relation between body and mind.

During the last two decades much knowledge has been gained through research. And educational methods and theories now advanced owe much to the facts discovered and the laws worked out in this way. Since psychological laboratories were established until within a year or two, experiments were directed, generally, toward investigations of the senses and the sensory side of our mental life. If movements were involved they were studied, not as produced, but as perceived. Much has been written on the sensations, or perception, or memory of movements, but scarcely anything on movements as indispensable elements of our mental life.

The *sole* difference of intelligence between man and animals was attributed to the difference between brain sizes and the differences between their sense organs. We are becoming conscious of the fact that it is not only what man sees, hears, or feels, but also the motor reactions which these phenomena excite, which make him what he is and different from the animals. Psychologists and child students, as well as animal trainers, are fully awakening to the importance of this element in education; and its significance they are beginning to work out. The activities of children and animals receive different interpretation. And the observations made tend rapidly to modify educational ideas. The new curriculum gives a larger place to the development of the sensori-motor life. And there is a general tendency to substitute "training" for "instruction" or "education." The reasons for the present points of view of pedagogy I shall now consider.

It is the nature of all organic material to respond to stimulation and it depends very largely on the physiological structure and organization of the reacting mechanism, as well as on the environment, how it shall respond and what shall be its capacity for intelligence. Of course, it depends very much on the constitution of the sense organs what the character of the sensation shall be. The eye can receive only light and the ear sound imprints, and the capacity for receiving these is in every case limited by the sense organ. For example, the range of the human ear is from 16 to 40,000 vibrations per second. Above 40,000 per second of vibrations in the air, there is no mechanism for receiving the impressions, and of all aerial vibrations beyond this limit we can know nothing so far as hearing them is concerned. The limits for vision lie between about 400 million million vibrations per second (red) and 800 million million vibrations per second (purple). Beyond these limits in either direction the human being can receive no sight impressions. There is, therefore, a gap between 40,000 and 400 million million vibrations per second in our external world that we can know nothing of because we have no senses to receive these impressions.

If the organism does not possess these specific sense mechanisms that are affected by ether or air vibrations, it can have no sensations of light or sound. Many of the lower forms are wanting in one or more of these capacities, while others have them in different proportions. Osmatic animals, like the dog, have a strong olfactory sense. The dog's method of representation and ours must be very different. The dog has a large "smell" memory, while ours is a "form" memory. He pictures largely in terms of odors; we in terms of shape, position, and color. If we carry on this analysis to the lowest forms, those that can have tactile impressions only (if they have the power to represent at all), must represent in terms of the sense capacity they possess. We can easily see that their environment and their mental life must be very different from ours. If one of us had been born blind and deaf, his world of representation would be entirely different from the world of those who see and hear; his dreams would be quite unlike those we dream. The more specific senses one has, and the more varied the impressions one can receive from the external world, the more definitely these impressions will be co-ordinated in the reproductive process. Animals with focalized vision can discriminate more closely and have the capacity for noticing details which others have not.

Important as these sense organs seem to be to the intelligence of the animal possessing them, they are by no means the all important thing. The capacity for intelligence is also very heavily conditioned by the variety, complexity, and delicacy, of the possible responses. The lower forms respond very simply because they have no differentiated tissues. They are formed by a simple mass of protoplasm, with but one nerve fibre to conduct the impulse from the anterior to the posterior end or vice versa; and the response can easily be calculated, because the impulse must travel in a definite way, i. e., through the path furnished it by the nerve tract.

The general law of response is away from the painful stimulus and toward the pleasureable one. As we pass up through the animal series this law still holds, but the process becomes more complicated. The higher the animal the greater the capacity to act relevantly to past experience. Acts become rational. The act may not be with respect to some immediate good, and this is especially distinctive of man. He contemplates the future and the act may be for some subsequent good. Man forestalls his future in just so far as he remembers his past. He is still an hedonic creature and the principle operates in the saving of money, in the preserving and storing of food, and in his religious activities.

In considering now why man stands at the head of intelligent beings I shall merely sum up what I have already pointed out and then proceed with the argument concerning the importance of the response factor in intelligence and its function in the learning process. It is obvious that the more delicate, varied, and minute, the sense data are the more detailed the perception. It was pointed out that man has focalized vision and all the other senses which favor him with impressions from the objective world.

The ability to learn depends not only on the structure and size of the brain, but also on the power to respond minutely, and varyingly.

The machinery for receiving impressions, the nerves for conducting the impulses, and the muscles for receiving nervous discharge, become more highly organized and specialized as we go up the scale, and this makes possible more delicate and complex reactions. Man has the most plastic brain, and in variety and delicacy of responses he supersedes all the other animals. He has speech and gesture and this presumes a very intricate response mechanism.

The nervous system is composed of three parts: the sensory, or afferent nerves, conducting the impulses from the sensory end organ to the brain; the brain, which receives and transmits the impulse to the motor nerves; and the motor, or efferent nerves, which conduct the impulse from the brain to the muscles and produce movement.

Every creature inherits a born structure which limits its ability to learn. Every young animal has certain capacities which determine its future. These capabilities are in terms of possible nervous connections and brain plasticity. In the lower forms, already mentioned, where there is but one nerve fibre to conduct the impulse, the reaction is limited to one definite response. In the higher forms the impulse has a number of possible paths open to it through the brain, and which one it shall take, depends on habit and experience. In man the brain is larger than in other animals, thus making possible a larger variety of sensori-motor connections.

The brain receives the incoming impulse and conducts it through one of its paths into an outgoing tract. It is the great central switching station where sensori-motor co-ordinations are made. And the impulse through the brain always takes the course of least resistance. The relative permeabilities of all the various possible paths through the brain are determined in two ways, phylogenetically and ontogenetically. The impulse tends to take the course it has always taken in the race. One might regard these definite inborn tendencies to react as race habits. It is as if each generation handed down their bodies with usury. The newly hatched chick pecks at particles of sand as soon as its toes are stimulated by them or as soon as they catch its sight. The colt walks as soon as its feet strike the ground. This is because the horse has always walked. In the race of horses the impulse from the foot has always stimulated a definite path through the brain thereupon discharging into a definite motor path, thus constantly causing the same movement. When sensory cell (a) in the colt's brain receives the sensory impulse from the foot it always discharges through a definite association path into motor cell (b), and thus always causes a definite muscle to contract. This sensori-motor connection between (a) and (b) is phylogenetically determined, i. e., inborn. Now in the brain of the human infant this connection is not so definite, because in the race the discharge (a) was not so uniformly into (b). Man in his ascendency has learned to modify his reactions. For example, he has learned to use his hands in thousands of different ways.

To the same stimulus the race has made a great variety of responses. That is, sensory cell (a) has discharged its impulse through various tracts in the brain into motor cells (b), (c), (d), (e), (f). And so, instead of definite connections inborn between (a) and (b), there is a less definite connection between (a) and all the motor cells (b), (c), (d), into which (a) has been discharged in the race. When (a) is discharged in the child's brain the impulse scatters. The impulse from (a) is diffused toward (b), (c) and (d), in proportion to the permeability of these various tracts. The greater the number of times two cells have discharged into each other in the race, the more permeable the paths between them. This diffused discharge in the brain of the infant child is what causes random movements. The colt is born a fully developed individual, able to exist wherever the adult horse can exist, whereas the child, for many years, is a helpless and dependent creature.

The diffusion of the impulse in the brain of the infant and the consequent helplessness is precisely the cause of the prolonged infancy. The colt has no infancy. It needs no training to adjust it to its environment. All its necessary actions are ready made at birth. It is a machine in complete running order. The child on the other hand, helpless, dependent, gets from its diffused reactions no help towards maintaining the organism. It would die in a short time if not cared for by its parents. The difference in the reactions between the young of these two species portrays in an admirable way the history of the race.

What is the significance of this long period of infancy and helplessness of the child? It has a tremendous bearing on its education. It can be stated as a general principle that the longer the period, the more varied is the history of that species, and the more pliable, adaptable, and teachable are the young of that species. The animal, with its useful reactions already formed at birth, is teachable only within very narrow limits, while the possibilities of adaptation, education, and intelligence of the human infant are almost without limits. The reason for this possibility of adaptation is as follows: An impulse from the sense organs of the child reaches the brain and is there diffused and results in a complex movement involving a great many muscles or motor elements. It is due to this complex response that the child stands at the head of hedonic creatures. Each element in this complex movement has for the child a pleasure-pain value. It gives the child a basis for discrimination, and he selects out that element of the whole response which is most pleasureable, and concentrates the impulse in the direction bringing the gratification. His own reactions furnish him a basis for choice and upon this fact depends his future possibilities for action with reference to ethical and æsthetic values. It can easily be seen that the animal born an automaton must remain comparatively limited in intelligence, because, as already shown, there is very little plasticity in the brain and only a narrow basis for the selection of values. The animal, consequently, to the same degree, can not become a moral or ethical creature.

The oftener a path is repeated by an impulse through the brain the more permeable that path becomes, so the course an impulse shall take is determined not only phylogenetically, but also ontogenetically, i. e., by individual habit. The impulse tends to take more definitely, each subsequent time, the course it has taken before. And a habit may finally become as automatic as though it were inborn. Physiologically what happens in the process of learning or getting adjusted is forming definite sensori-motor connections in the brain. Learning implies a definite response to a definite stimulus. All our mental life must be bound up with movements. There can be no intelligence, not even consciousness without them. Here is where speech and gesture show significance. Many of the higher animals make inarticulate cries and gestures, and these are very valuable in the animal's mental processes.

Immediately after its birth the child makes expressive cries. These very rapidly become differentiated, expressing the different states of mind—croaks, grunts, cries expressive of loneliness, of anger, fear, pain, begging, etc. Soon inarticulate cries appear and the child would develop a sort of language which would be an index to his mental life. Out of this grosser, cruder, method of expression it develops a finer, a more delicate and specific form of expression. This, in general, is the process. The child sees an object, e. g., a dog, which causes him to shrink with fear. Every time the dog is presented the fear returns and there are definite sensori-motor coordinations made in the brain between the sight impulse of the dog and the muscular contractions indicating to the child the feeling and state of mind invoked. If in the future some sight impulse other than that of the dog calls up a response of fear, a memory of the dog, which was formerly the object of the fear response, may also be called up. So the response of fear, i. e., the motor elements common in the response to both the objects of fear, associates in the mind these two objects. The same is true with any other response having common elements for two objects.

Now the child in society, through imitation and coercion, learns the conventional responses. He sees the dog and hears his mother say the word "dog." He learns also to say the word "dog" and finally the word "dog" and its image become associated in his mind, and whenever he sees a dog he says the word, and whenever he says the word an image comes up in his mind. The association works both ways. Without language there can be no thought. This is a position contrary to that of many psychologists, but it is one that seems to me entirely verifiable. In language I, of course, include all the responses of expression. Mutes' language is one entirely of gesture.

Without expression, no representation is possible. A man sees a lion and learns to call it by some name (e. g., lion). He sees a hill and learns to call it by some name. And so he learns a large series of objects and associates each of them with definite vocal responses. Likewise he associates activities and relations with definite and specific vocal responses. When he sees any two or more of these objects, activities, or relations together, he responds them together, or, if he responds them together the images of them

occur together, and he has what might be termed an imagination product. For example, an animal without the power of making these sensori-speech associations could never think of a lion on the top of a snow capped peak, because he had never seen them in that relation to each other. He can get no contiguity or succession of two images or activities which he had not experienced in that connection. Thus only that being which learns to respond to the objects of his world in a delicate and definite way, such as is alone possible through speech, can ever bring them together arbitrarily in his mind, in one mental picture or product. And the more intimate the connection between an experience and its peculiar motor processes, the greater is the command over it in ideal representation.

Furthermore, his reasoning powers must remain very crude and can never rise above analogy, if he has not speech. He has not the power to notice details. Objects cannot stand out before him clear cut, made up of parts. He sees things as wholes, and the constitutive parts of situations in which he acts can never become objects of his consciousness. He cannot discriminate elements, and consequently has but small powers to classify, and as a result his reasoning and constructive ability are at a minimum.

As soon as man has this constructive power of bringing two images or activities together in his mind through the medium of their responses, then he actually does bring them together. His mind becomes productive. His fancies are incorporated in what he produces. He puts the products of his mind into actual existence. And thus he changes his environment, and this embraces the last aspect of the learning process.

The environment for each succeeding generation differs. The experiences of the past generations are objectively embodied in the present environment. These ideas are in the form of commerce, industries, houses, machinery, etc. Our objective environment with railroads, mills, cities, magazines and telegraphs, is very different from that of the primitive savage who lived in rude huts, followed foot-paths through the forest, and was dependent upon natural resources for his well-being. Our spiritual environment is also vastly different. At our disposal are all the thoughts and theories that ever inspired the human mind. By means of language there is community of mind. What I read or hear I can immediately represent to myself. By this means there is a leveling of experience, and perpetuation of thought, which becomes the heritage of the coming generations. We receive as our heritage the knowledge and experience of the past, and we hand it down with usury. By this process of elaboration and incorporation into language, literature, philosophy and machinery, time and space are eliminated, and we live as in a timeless and spaceless world. All the experiences of the past may become our personal experiences. By means of this cumulative race experience the laws of nature are gradually discovered and its forces harnessed. This facilitates communication and accelerates progress by putting each individual into a universal environment where all the factors are active and vital forces.

It sums itself all up in this brief statement. Both the environment and the human organism are constantly changing so as to produce a longer period of adjustment, i. e., a longer period of infancy. These laws of change can be ascertained mathematically, but the co-efficients representing the conditions at any given time must be empirically determined. The great strides in educational progress during the last decade and in the decade to come, must be attributed to the application in this field, of the methods of science, and the principles of evolution. Education is a process of adjustment, and it becomes efficient only in proportion as it studies the laws of change, or progress, and the factors involved in the adjustment process.

It is curiously contended by Münsterberg (Psychology and Life) that advancement in psychological knowledge does not contribute much toward a solution of the problems of life and of education. But almost every other authority would, I think, contest this point of view, and accept the position maintained in this essay, namely, that much of the advancement in educational method is attributable to progress in Psychology, as well as science in general. Who would deny the great influence of the principle of self-activity of the Herbartians upon educational methods? Who would say that Bain and Stout, or, even James, in pointing out the function of the motor elements in the processes of analysis and synthesis, did not equally modify educational doctrines? Even the work of Groos on "The Play of Man and Animals," had its effect on education. Its influence on the development of kindergarten methods and on the introduction of marching and calisthenics in the schools easily can be seen.

The principles which have been pointed out above are already pretty generally recognized, and applied to some extent in different schools throughout this country. But education is always conservative; old methods die hard, and new ones are substituted with considerable reluctance. The purpose of this article, therefore, is to encourage greater emphasis upon the sensori-motor training and to show its scientific sanction.

The time is just passing when the ideal school discipline was to have children absolutely quiet while getting their lessons (from books), or preparing their exercises. It was learned that this had a doubly bad effect upon them. It was hard on their physical constitution, and it made them mentally dull. Conditions were somewhat ameliorated, especially from the standpoint of health, by the introduction of more exercise (these periods of intellectual drudgery being interspersed with marching and calisthenics). But the essential point in the learning process was missed, and the child continued in its dullness and mental inertia.

A major portion of the knowledge acquired in many primary schools is not knowledge at all, in the true sense. It is not made up of rich ideas, of images, and concepts. It is hollow, mere parroting. The images which the child forms are "word images." Work with books in primary education is blinding drudgery, and is likely to yield but one form of mental discipline—the power of self-denial.

Childhood is for training the senses, the power of observation, discrimination and comparison. The result ought to be a bright, live, keen, alert individual, with a rich mental content, and a healthy moral tone. The product of the school is likely to have only the memory trained, and to be an intellectual and moral automaton, with no power to act freely and rationally—a stupid, morbid, unhappy creature, with very little power to adjust himself to his environment. If the training of childhood has been neglected or wrongly directed, no amount of superstruction can remedy the bad effects. Childhood is the time for laying the foundation of the intellectual and moral life, and where this is not properly done, the usefulness and happiness of adult life is greatly marred.

The ideal primary school teacher is Nature, aided by a director or tutor; and the ideal school is the neighborhood in which the child lives. The child should first get a knowledge of the objects of nature first hand, by examining, handling, comparing. The more intimately a given experience is connected with motor processes peculiar to it and distinctive of it, the greater the command over its ideal representation. A child cannot describe anything that it was engaged in, without acting it out to the full length that the circumstances permit. Thinking is restrained acting. Perceptual processes are penetrated thoroughly by experiences of movement. Description should accompany observation and comparison, because the ideal process (being a reproduction of the perceptual) tends to reinstate the movements which form an essential part of it.

When the child, by observation, has learned of the things of his own community; he will naturally wish to know of the things in another community, especially if his tutor is wise in directing his observations and showing him the conditions of existence. The knowledge he can gain of other communities he must get through reading; and so he will have a motive in learning to read. He will have an apperceptive basis for gaining a knowledge of another community and the great principle "from the known to the unknown" can be consistently followed. At this stage also is the place to begin the study of language, as involved in the descriptive and discriminating process; and of arithmetic, as involved in the enumerating process. In this way learning is natural, interesting and efficient. It develops all the faculties of the mind, and in their natural order. It furnishes control over the organism, thus insuring health and power; and it adjusts the individual to his environment. Finally, it makes knowledge real and vital.

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THE COURSE OF STUDY

AND THE

DEGREES OF STATE UNIVERSITIES.†

By Fred B. R. Hellems.

It was with the deepest regret that President Baker resigned the work of preparing a discussion of the topics assigned under this division of the program; but various causes united to preclude even his helping me with the advice for which I should have been so grateful, and he should not be held responsible for any defects in my treatment of the subject. Before entrusting it to me, however, he had laid the foundation for a paper by sending out a circular letter containing your questions, and when he turned the material over to me a couple of days ago, I found that it consisted practically of one hundred and seventy-seven replies to his questionnaire. Accordingly, with slight supplementing of this material, I was enabled to place before you the results of opinions expressed by twenty-eight state universities, by sixty-three of the larger or medium-sized universities and colleges not receiving state support, and by sixty-eight of the smaller institutions. If my paper is marred by a tendency to statistical treatment, may I hope that you will remember the nature of the topics, the significance of reliable figures and the natural desire of a less experienced worker to come before his recognized seniors with a maximum of facts from good sources and a minimum of his personal opinions?

In an earnest effort to reduce the length of this inevitably long paper and to make the results as tangible as possible, I have taken the liberty of introducing the questions under a rather different grouping from the original outline of our program; but I trust that I shall deal with the issues really intended, and I am sure that I shall not in any way cause inconvenience to the other speakers under this section.

The first general question, then, I understand to be equivalent to this: Shall the standard College of Liberal Arts have courses leading to separate degrees of bachelor rank or to one bachelor's degree only, which would naturally be the degree Bachelor of Arts? This question will include B. E and F, 1.

† This paper was read at the meeting of the National Association of Presidents of State Universities, at Des Moines, Iowa, November 1st, 1904.

At present the practice among the institutions for which figures were available is represented by this table:

	Answering	Separate degrees	No separate degrees
State	27	16	11
Larger (including medium-sized)......	61	39	22
Smaller	86	55	31

In weighing these figures one must bear in mind such cases as Wisconsin and Michigan, which are included numerically with the institutions having separate degrees. At Wisconsin the degree Bachelor of Philosophy is really a special degree for graduates of a normal school who have taken two additional years in the university. At Michigan the degree A. B. is given to the great bulk of the literary students; but if a candidate who has specialized in science distinctly prefers B. S., the latter degree is conferred upon him.

The figures of practice, however, are distinctly different from the figures of theory, for when we come to the question: "Do you favor one bachelor's degree in the College of Liberal Arts?" we find the following condition:

	Answering	Favoring one degree	Opposing	Undecided
State	23	17	5	1
Larger	46	27	19	..
Smaller	55	28	27	..

Naturally, too, the figures as to this question of one degree are practically duplicated by the figures on the question whether the degree A. B. should be given for all courses in the College of Liberal Arts. For this latter, F of our program, the standing was as follows:

	Answering	Favoring A. B. for all	Opposed	Undecided
State	26	18	7	1
Larger	54	31	21	2
Smaller	62	30	29	3

One or two replies carried the caution that they were personal rather than official. Accordingly, among the state universities opposed to one degree I have included Nebraska; but Chancellor Andrews expressed himself in favor of the degree A. B. for all courses in the College of Liberal Arts. The action of Michigan was taken after such a long consideration and aroused such general interest that I quote President Angell's reply. "After long discussions and many years' waiting, we decided to give the degree of A. B. and drop the degrees of Ph. B. and B. L. The general ground was this: Formerly the A. B. had a historic significance. It meant Greek and Latin, and so long as that was the case we did not feel that we had the right alone to depart from it. But when so many of the leading universities conferred their degrees on such a basis that that historic significance was lost, we decided to recognize the various branches as of equivalent academic value, and so to give the degree of A. B. for any one of the regular four years' combina-

tions of studies. On the whole, that seems likely to prevail, I think, though there are some in our Faculty who are still opposed to it."

Of the larger universities that are not state institutions, Harvard, of course, has no separate degrees, nor has Yale or Cornell. Chicago confers the three ordinary degrees, as well as an E. B. for the School of Education. Columbia has just been discussing the question very warmly, and the advance sheets of the President's report record the outcome. This case should perhaps be noted, for it looks like a reaction from one degree; but the explanation really is that Columbia is the newest recruit to the ranks of those not absolutely excluding from a bachelor's degree the student who lacks Greek and Latin. The Faculty have withdrawn from the position taken rather decidedly in 1902, that knowledge of one ancient language should be required from all candidates for the bachelor's degree. "The Faculty are now prepared, without dissent, to frame one or more curriculums that shall give the students who follow them a general education based on the study of the natural sciences, and to offer such students the degree of Bachelor of Science. By decisive vote the Faculty declined to recommend that the degree of Bachelor of Arts be conferred upon students who have not studied Latin."

As a result of it all we may say that the state universities strikingly favor the degree A. B. as the bachelor's degree for all courses in the College of Liberal Arts, and that in the other larger universities there is a strong movement in the same direction.

The next topics in order are the major and minor system and the group system, B 2 and 3 of our program, and on these I need detain you only a moment.

	Answering	Major and minor	Group	Combination (i. e. affirmative answer to both questions)
State	24	13	11	5
Larger	61	18	25	11
Smaller	85	25	30	11

I am by no means sure that the question was clearly understood in the same sense by the recipients of the circular and our figures may therefore not be as significant as in some of the other cases. Furthermore, if I might be allowed to intrude on the discussion, I should hazard the guess that the group system has not received the consideration it really deserves. When the great wave of election deluged our dry land of prescribed work it was impetuous, in many cases irresistible, and swept us along with it so rushingly that we could hardly get our feet to look about us, even at a group system. I am not sure that the framers of our curricula have examined with final thoroughness this plan of letting a man elect to follow a general line with X as the prominent department, and then saying to him: "You must take certain courses in X, and also certain courses in the kindred department Y, or the kindred department Z, or in both of the kindred departments Y and Z." Furthermore, as a minor difficulty, I fancy even that patient, if unlovely

beast of burden, the college dean, sometimes shrinks from the adjustment of schedules, always a difficult task, and particularly from their adjustment on this basis, for to him who will make a schedule the group system is as the untempered east wind to the shorn lamb. But I cannot help believing that in the near future the question will receive very earnest attention, and that there will be a movement in the direction of intelligent group systems.

The third topic is really the relation of the college and technical schools and under this head I have grouped the questions of C, D, G. Herewith we are brought face to face with the university sphinx, or something not less deadly, if President Butler's view is to be accepted. We must solve the problem or be consumed. Pages 18 and following, of the advance sheets of his report to the trustees of Columbia, dated October 3d, 1904, contain a brief statement of the problem. "There is the same diversity of opinion in the university as exists throughout the country, as to whether or not the familiar American college can be preserved in the reorganization of higher education, which is upon us. It is perhaps fair to say, that a small minority do not think it worth preserving. Those who value the college, but who think it impossible to preserve that institution in its historic form, regard it as certain that the college will be compelled to give over one-half of its present work to the secondary school, and the other half to the universities and their professional schools. Such a state of affairs would reproduce in the United States the educational organization of Germany. Those who value the college and believe it possible to preserve it by appropriate academic legislation, fall into two groups. The one group feel that the college would be stronger if it stood alone and admitted no admixture of professional studies into its program. The other group take the contrary view and hold that unless the college permits its students to choose professional courses in law, medicine, and technology as part of their curriculum, the college itself cannot continue long to exist."

Now most of us do not aspire to a complete Nirvana, even if it be painless, and evidently the Faculty of Columbia are of us, for we have the following announcement, which I quote in part, because it seems to state the affirmative side of the question so adequately.

"The American college in general, and Columbia College in particular, can and should be maintained in its integrity as a school of liberal learning, essential both to the specialization of studies which follows, and to the inculcation of those ideals of knowledge and of culture which are the choicest and most useful products of our historic civilization.

"The time-element in a college curriculum is important, but not so important as the attainment of a certain standard of scholarly excellence and intellectual maturity. When that standard is reached, and not before that, the student should be graduated.

"The college, and the university as a whole, will gain, not lose, by adhering to the policy of permitting undergraduate students to choose professional courses in law, medicine, technology, teaching or fine arts, as part of a

curriculum leading to the degree of Bachelor of Arts. There is earnest dissent from this conclusion on the part of a minority."

In the meantime the state universities, rather characteristically, have worked out a practical solution. Here, fortunately, I need not bother you with figures, for in spite of a few honest protests against the counting of technical work towards a college degree, there is a very great preponderance of opinion among the state universities to the following effect:

1. The candidates for the bachelor's degree in the college may take electives in the professional school equivalent to approximately one year's college work.

2. A student may shorten his combined arts and medical course by one year, i. e., he may complete them in seven instead of eight years.

3. He may similarly shorten his combined arts and law courses, completing them in six instead of seven years.

4. He may shorten his combined arts and engineering course by at least one year, and generally by considerably more if he chooses his electives with this end in view.

In this connection we may recall that in many of the larger universities the specializing student in his senior year will often find scheduled such subjects as in many of the state universities are given ordinarily in the technical schools. One need only think of some of the special departments under biology, for example, or physics. So that in the larger non-state institutions under discussion the outcome is much the same as in the state universities.

In this general connection I ought not to fail to report that although the question was not asked in the circular, sixty of the smaller colleges recorded their firm belief that the prescribed academic course ought to be four years. It is easy for us to sympathize with their point of view, for apart entirely from their theoretical devotion to an ideal quadrennium they do so suffer practically from the attractiveness of such combinations as we have been discussing, combinations which they themselves cannot offer.

Turning now to the second division of F, with its inquiry as to what degree shall be given to a graduate of bachelor's grade from engineering schools, we find the following results:

	Answering	B. S. defined, e. g. B. S. in M. E., or B. S. (M. E.)	B. S.	Type B. M. E.
State	26	18	5	3
Larger	21	15	4	2
Smaller	24	4	9	11

The addition of courses in chemical engineering, mining engineering, etc., does not make the question any easier, but I would call attention to the neatness and simplicity of the system that merely includes in brackets after the degree B. S. two descriptive letters, or if necessary a syllable and a letter, e. g., B. S. (C. E.), B. S. (Chem. E.), B. S. (Agr.). From the circular, however, I could not infer how commonly it was employed.

The last topic, graduate work in the state university, evoked some suggestive replies. A very few respondents thought that the state university ought not to undertake graduate work, assigning such reasons as these:

1. Too costly.
2. Would discourage private benefactions.
3. Would needlessly duplicate work already done.
4. Would lead to neglect of undergraduate work.
5. Would offer too much political temptation, etc.

But on the whole, the replies were preponderantly in favor of the development of graduate work in the state universities as rapidly as possible, not only for its own sake, but for its influence on the undergraduate teaching. One experienced president pointed out that the departments which manage to keep going the most graduate work do also the best undergraduate work. Of no small interest was the fact that not a few of the smaller institutions felt that the state universities should aim at making the graduate work their primary consideration. President Elliot suggests: "This seems to me a question of *most acceptable expenditure,* a graduate school is for a few at a heavy cost." President Plantz, of Lawrence, goes to the center of the question with his doubts whether the state has a right to tax the people in order to educate men in specialties. "It would seem," he says, "that men who have been given a college course could pay their own bills for advanced work." In other words, ought the people bear the expense of research instead of leaving it to generous philanthropists? To these questions the man who knows the American people must believe that time is bringing only one answer. As a teacher I may be allowed to say that to most of us the graduate work we can manage to do is a sort of intellectual and educational hill-climbing from which we return with broader mental horizons, feeling more fit and vigorous for our other teaching.

May I give a brief résumé?

1. The trend in the state universities is very strongly towards the A. B. degree for all college courses.

2. The group system seems to deserve serious and favorable consideration in the near future.

3. The student who wishes to combine college and technical courses can save, and should be allowed to save, one year if the combination is with law or medicine, and probably more if it is with engineering.

4. In schools of engineering the majority give the degree B. S. defined, e. g. B. S. in M. E. or B. S. (M. E.) Personally I favor the type B. S. (M. E.)

5. The state universities should develop graduate work as rapidly as their resources will permit. The people will submit to taxation for research, particularly if it is treated as part of a helpful state institution.

WHAT IS EDUCATION?

By Joseph H. Bair.

Education, the greatest of arts as yet little understood, is making sure progress because its principles are more and more sought in the common nature of man; and the great truth is spreading that all have a right to its aid. There is a growing thirst for knowledge, for intellectual action, for something more than mere animal life; and society is beginning to realize that every mind was made for growth and intelligence, and that its nature is sinned against when doomed to ignorance. The consciousness of this has seized the public mind and education is becoming the work of nations. Schools are now open to every child, where the foundations for future progress are laid. The greatest of minds are at work on popular education. The state is beginning to feel the importance of intelligence for all its members, consequently it is applying its revenues most liberally to all forms of education, and is assuming the responsibility of instructing the masses.

Since the theory of evolution made its advent every field of thought has been canvassed with renewed vigor, and knowledge is sought as a mighty power by which nature is not only to be opened to thought, but to be subjected to our needs. Science has multiplied fields of inquiry for all orders of mind. One of the most fruitful of these fields is history. History portrays the laws of progress and places man in the category of evolved things. Boundless efforts have been made, by going back over man's past and examining the laws, institutions, and arts, in his different stages toward civilization, to discover the nature of his intellectual, moral, and religious development. It is only as we learn that nature that progress can be facilitated and controlled. It is this historical interest that renders a science of human nature possible, and consequently a science of education.

In history is given the cue for the nature of the growth of the human mind, and the teacher above all others should comprehend the laws of this growth. He should be able, in the light of his knowledge of human development, to explain the principles he turns to account in the educational process, and instead of working as a machine, he should join intelligence to his toil. Until he knows what education is, in the light of its historical setting, and the basis for the application of certain pedagogical principles, he cannot hope to be a very efficient teacher. He cannot bring out of the child all that is in the stuff.

From the standpoint of the principles involved the question: What is education? is an important one for all teachers. No teacher not understand-

ing the factors involved in the development of intelligence in man can comprehend an adequate answer. Educators have failed to impress sufficiently upon their teachers the fact that man—physical, mental, moral, and religious—has evolved; and the necessity of going back over history to retrace his steps, and to work out the constituents of his progress, in order that they may have that intelligent insight into human nature so essential to their profession. All advances made in educational methods are due to the laying hold of some principles of development and applying them.

The nature of education can best be understood by an examination of the conditions of progress, and one of the most obvious essentials is an educable, plastic individual able to benefit by experience. Natural history shows that this docility which the human race possesses over other animals is due to the prolongation of infancy. This power to learn by experience is what renders man superior and gives him a spiritual environment. If it is true, as it certainly is, that man evolved in his mental and spiritual life, there must have been a time when his intellect was not so keen nor his moral codes so well defined. The child in his powers of mind and his view of the world develops in a remarkably similar way to the primitive man, consequently primitive history is attracting to itself a twofold interest. History furnishes a record of the conditions in society, and their respective consequences, and from these general principles can be deduced which were potent in man's progress and which can be applied to the individual's development. History is a portrayal of the mind's demeanor under set conditions, hence it serves as a psychological laboratory in which all the individuals of the past acted as subjects and have contributed their share toward a possible discovery of what are the ideal conditions and what are the representative methods of educating the child so as to realize himself as an adult in these conditions.

The environment of man has wonderfully changed since the first dawn of history, and it is possible to determine the nature of that environment in a more or less definite degree. The most primitive environment of man was nature unmodified. There were no traditions, no preconceived notions on the part of the parents which were given the child as interpretations of his experiences. Or if the parent has notions about things, they are practically the same as those the child would form if left to interpret his own experience. Savages in their ideas, beliefs and actions, are very much like a group of men grown up with men who have no other notions about the world and things than those inferred from their own experiences. It is obvious these ideas would be very different from those of a member of advanced society. All their thinking must be within the limits of their personal experience. In developing the concept of education I shall attempt to portray the difference.

We can comprehend the thoughts produced in the mind of primitive man, in contact with his surroundings, only by looking at those surroundings from his point of view. In order to be able to do so we must divest the mind of its accumulated knowledge and mental habits acquired by education,

and suppress all the conceptions of things developed in an intelligent community. This is very difficult to accomplish even partially.

The child mind in comprehension, in ways of looking at things, in assigning values to things, and in acting upon its beliefs, is very similar to the savage. This inability of teachers to apprehend things in the way the child apprehends them, renders them inefficient in communicating their ideas to the child mind. This is the supreme difficulty in teaching. This fact is impressed upon us, when we observe what unfit methods are employed by them. that even among disciplined educators the power to frame thoughts very unlike their own is extremely limited. We have ample evidence of the prevailing inability to conceive the ideas of the undeveloped mind—when we observe how arithmetic is introduced under the purely rational form instead of the empirical with which it should be commenced by the child, and as it was commenced by the race—when we see abstract grammar taught analytically instead of synthetically, and put among the first instead of the last studies—and when we know that the young mind is plied with generalities while it has as yet none of the concrete facts upon which they are based. Although they have been children, it is difficult to rethink the thoughts of the child, to look at the things with the eyes of absolute ignorance, and observe how their attributes and actions originally grouped themselves in the mind. Nevertheless it is imperative for good teachers to do their best to conceive the surrounding world as it appears to the child. It is possible to make some approach to these conceptions only by indirect process. Guided by the doctrine of mental development, we may be able to delineate some of these juvenile notions in some of their leading characteristics. And having worked out their characters, we can imagine them and then assume them as existing.

Let us take, for example, the concept of the world of the untutored child, or savage. In extent it is to the north, south, east and west the distance he can see or has experienced in these directions. The earth is flat and vaulted in by the sky which meets it at its edges—the horizon. Above the sky is a place (This is the case even with a great many ancient peoples considerably advanced) regarded as heaven, which is very bright. The stars are holes in the sky through which the brightness of heaven comes at night, and through which it rains when water is poured on the floor of heaven. The sun is an object, or animated being, traveling daily along the sky and returning above the sky or beneath the earth each night. These ideas are natural, and under the conditions they occur, rational. The laws of thought are everywhere the same, and from the data known to the savage or child, his inferences are reasonable. To the savage who has no other means of knowing than personal experience the sun is a spirit either good or bad—good, if it daily sheds agreeable warmth upon him, bad, if whenever it is present there is disagreeable heat and fever. He soon attributes the presence or absence of these pleasurable or painful sensations to the presence or absence of the sun, and hence it becomes a benevolent or malevolent spirit as the case may

be. And in the light of the data from which he reasons, his conclusion and attitude toward the sun are not so difficult to understand.

Primitive man is the creature of his immediate surroundings. He is a helpless creature in the forest, or on the plain. He has no control over the forces of nature. When it rains, he can only let it rain, and get wet; when it snows or blows, he must tolerate it also. These forces he also animates and regards them as malevolent. In fact he animates everything. This we have all observed in children. The process is again a logical one. The wind blows upon the child, or the savage, he feels the chill. It also blows upon his fellows, pets, and toys. He attributes to them the same feeling. It rains on him and he feels wet. It also rains on the stone, and on everything exposed. They get wet, and he infers that they feel wet. When the child is hit, he feels the hurt. He also infers that it hurts the stone to be hit. Children are often seen to retaliate with some inanimate thing at which they hurt themselves. These inferences, made in this low stage of intelligence and power to discriminate, again in the light of the facts upon which the inferences are based, are reasonable. The child's or the savage's acts are continually conditioned by his notions of the nature of the things of his world. As the power to discriminate develops, the power to perceive differences as well as likenesses also develops. We all know that when a child begins to talk he calls all men papa, indiscriminately. He confuses every man with papa because he sees no difference between them. The writer has twin cousins whom when a boy he was not able to know apart. They seemed identical. Now that he sees that they are so unlike, it is hard to realize that he should ever have confused them. The perception of individuals is impossible without the perception of differences. This perception proceeds, with the development of intelligence, by the classing of objects and relations. Perception of objects implies that their attributes are severally classed with their like previously-perceived attributes, and their relations with like previously-known relations; while the object in being interpreted, is classed with its like as such or such. When this stage of intelligence has been attained, classification begins to become less erroneous. The child and the savage cease to animate. The child observes that when he is hit he cries, so do other children, so do many animals. So he infers from this likeness of response, likeness of feeling, whereas from the difference of response, i. e., the stone does not cry when hit, he concludes that the stone does not feel the pain. The child, at first refers its own feeling and mental qualities to everything indiscriminately, but as the power to perceive differences develops, the range of things that have similar consciousnesses becomes very much limited.

I do not know whether it has occurred to the reader, but it must be of interest to the teacher to know that our method as adults of knowing other minds is similar to that upon which the child assumes them. I cannot know other minds except in so far as I eject my consciousness and attribute to them my thoughts, feelings, and will. I know your mind only in so far as I

can compare your actions with mine, and then introspect my own consciousness. I cannot know your mind directly, I only infer it. I can get a correct notion of your mind only in so far as I make valid inferences from comparisons of your actions with mine. Your mind may represent the civilized one, mine the savage. Your ideas of things therefore are comprehensive, mine simple. Your notions about things are those which science and experience assign to them, mine those notions which the things themselves impress upon me. How can I then know your mind. The savage assumes that your notions about things are similar to his and on that basis he attempts to communicate with you. The teacher oftimes forgets that the child's notions about things are not like his and consequently fails to communicate with the child. He fails to impart his information in such a way that the child can comprehend it and be advanced by it. Herein lies the supreme difficulty in teaching, and it is for this reason that I wish to be explicit.

To comprehend clearly the difficulty the teacher has in communicating effectively his knowledge to the child so that it can enter into living, vital relation with its notion of things let me picture, e. g., just one instance of the vast difference between the teacher's and child's idea of the same thing. Contrast the following concept of the world or universe of the teacher with that of the naive child or savage pictured above. The teacher's earth is not a flat, vaulted in world very much limited in size, but is a large spherical planet with others of its kind revolving around the sun. Each planet has its satellites (or moons) revolving around it as it does around the sun. The sun is possibly one among other similar bodies revolving with its system around another body. The stars are not holes in the sky, but bodies like the earth traveling their course through space. Some of these are known to be many years of light away from our earth. It is only as we appreciate this vast difference between the two ideas described that we can fully comprehend the significance of education. How vastly different are the teacher's values and standards from those of the child. How can we bring up the child in his development so that his concepts of things and his attitude toward them, are the same as ours? This is practically the problem in the education of each child.

In an article in the preceding issue of this publication was undertaken an outline of some of the factors involved in this process of education. In it was embraced a discussion of the physiological basis for education. Assuming that the argument is correct I shall attempt to show from the same standpoint the process of the spiritualization of the child in society. By spiritualization I mean the standards, values, and habits acquired in the process of adjustment to that society, or more correctly, in the educational process.

The child, like all living beings, is so constituted that it responds to stimuli. These stimuli with the highly developed senses, can make impressions on the organism at a distance. Every stimulus as a result of the response it has produced in the organism, gets associated with it a value. If left to himself, with no interpretations or suggestions regarding them from

those more intelligent, the child will develop a system of habits of response which are in direct relation to the pleasure-pain values of his impressions of the things with which he is surrounded, and he will be like the savage in his beliefs and ideas about these things. These values and habits are obviously very different from those he would develop in society. Immediate values *per se* do not act efficiently in the direction of responses and the formation of the habits of the child growing up in civilized society. The conditions of the social environment are factors in determining the assignment of values and the formation of habits.

Society implies the existence of certain values which constitute the standards for directing and determining the growth of the individual in the formation of his character. In a civilized community there are no naked stimuli. Things come to the child with the values that they are charged with in the life of the community. Every experience the child gets is interpreted for it through its social context. The experience of the race assigns values to things instead of the individual's experience, as is the case with the child in a savage community. I do not mean by this that a child growing up as a member of a savage community would not have its experiences interpreted for it, as is the case in a civilized community. What I mean is that the values assigned by that savage community to the child's experience would be more nearly those assigned by itself if left to infer its own meaning of them.

Immediately upon the entry of the child on the arena of life a process of adaptation and interpretation begins whereby he is adjusted to his social environment, so that finally he develops into complete membership in the life of that society. The following is an outline of how this adjustment process proceeds in the child of a civilized community. The child begins by responding arbitrarily to the various stimuli or, as already mentioned, in terms of their immediate values. Some of these responses are approved of by parents and society. The child is, therefore, encouraged in repeating them because he is given candy, patted and praised. Others are disapproved of by punishment. Consequently, the child soon becomes an actor, playing for effect. He takes the course of least resistance. His reactions are no more conditioned by their inherent values, but by the applause they bring. These factors operate and the process continues until he has formed definite habits and is completely conventionalized. The child thinks, believes and acts as the other members of the community do.

The child is born with many impulses, but these are unorganized and capricious. Through habits, customs, and the existing order of social functioning, models are set in relation to which the various individual tendencies are organized. This organization takes place through the different oft repeated reactions to the particular objects of our environment or surroundings, and the assumption of the same attitude on the part of the child toward them that other people have.

Language is the most completely conventional thing in any society and more than anything else tends to produce homogeneity and to maintain the social order. Through the kind of reactions the child is encouraged to make or suppress making and through what he sees other people doing in relation to the things about him, he gets a characteristic attitude toward them. Language is a very important factor, aside from its formal consideration, in the educational process. It is imposed upon the child in the same way as any conventionality. It is only by means of language that many of the mental processes, in their finer consideration, can function. Without language there can be very little suggestion, and one mind can know only to the most limited extent what is in the mind of another. There can only be community of thought and like-mindedness in so far as there is likeness of response to the same things. Language permits the mind to travel through time and space, and it is only by means of it that representation and productive imagery, in the human sense, are possible.

Thus it will be seen what ought to be the type of education in the first stages of child-life. Primary education is necessarily concrete. The child should continually be in direct contact with the stimuli which produce his acts. It is a time which should be devoted mainly to the formation of connections between things and responses, to a process of sensori-motor coördination. The purpose is two-fold:—to get the child acquainted with the things of its world and able to form faithful images of those things when absent. How can the child form an image of absent things? If the child has made a particular response to a certain stimulus a sufficient number of times to make the connection habitual, then when the response is arbitrarily made the image of the stimulus comes up in the mind. Language is a system of arbitrary responses. By means of it a person can bring together in his mind the images of any things which he has associated with arbitrary responses. Teacher and pupil can only communicate their thought in so far as they have a similar system of responses. By uttering the name of an object I bring up the image of the thing for which that is the response, both in my own mind and in that of my hearer. In order that the child may have rich, vivid representation, it must have made many sensori-speech connections in its mind. Many of these associations are made between words and the utterance of them so that in these cases when the word is uttered there is no image except that of the written word. Representation is arid and knowledge is unreal.

From this point of view of motor education, or more correctly, of sensori-motor education, in order to understand the process of education the nature of association is significant. In this process of sensori-speech habituation the image of the object to which we respond is never unattended. A thing has always a setting. It is surrounded by other objects. Consequently when on subsequent occasions we call up, by the response, its image, the images of the other objects in that setting come up also. This is the law of contiguity. The second law of association is that of succession. Our re-

sponses are not solitary. During the course of our responses to the things about us we respond now to this, now to that thing. These responses become so connected that if one is made arbitrarily or as a result of its associated stimulus, the ones habitually succeeding will also be made and their images come up in the mind.

These responses are not always united originally in experience (i. e., when the names of the things are learned), but may be united in some learning process. When we have once united two images by responding their names together, they are likely to appear together subsequently. In reading, the sensori-motor connections between the words and the images which they represent have been made before, but here they become serially connected. This makes trends of thought possible. Without language no imagery would be possible except that which is actually impressing itself upon the senses. Language makes imagery possible; first, reproductive, and, secondly, productive or constructive imagery. Language makes it possible to bring the scenery into the mind by merely uttering the responses associated with this scenery. The scenery can be shifted by uttering other responses. The scenery can be complicated or modified by uttering responses or names of things which we never experienced together. No one ever experienced a horse with a man's head. But you can say "horse with man's head," and there is the image. This image by means of language can be manipulated in all sorts of ways.

The difference between primitive man and the civilized one is the limited imagery of the former. He acts upon his immediate surroundings. Civilized man has continually rich imagery in his mind not directly present to the senses. These images in the mind control his activities. They are the stimuli upon which he acts instead of any direct concrete presentation to the senses. He learns to disregard his surroundings and is controlled by an ideal world.

Language is only efficient in directing the thought and activities of children in so far as each word is associated in their minds respectively with an image of a thing or a relation. The child's activities can be controlled by controlling his imagery. Give the child an image either through direct presentation of stimulus to his senses, through a model offered him in your actions, or a picture by means of language, and according to the association which that image has with other images or values, will be his action. In this fact lies the reason that a teacher or parent should never have any dont's for the child. The forbidding of anything brings the image of that thing into the mind and the action is determined by the imagery with which it is associated. The results are inevitable. If the activities of the child are proceeding in the wrong direction they can only be inhibited by the substitution of other images in the mind of the actor which call forth desirable actions.

From all that has been said the teacher might be led to infer that the educational process by which the environment impresses itself upon the child

is one-sided, that it is a process of adjustment by copying, and that the individual's make-up does not come into play at all, but conforms to the things about him. This is not so. The child always starts from natural impulse. Things get certain values, of course, and connections. But he copies activities only when he is inherently self active in that direction. There are times e. g. when the child's talking impulses come into play. Different instincts appear at different ages of the child. If these instincts are not allowed to function they will gradually disappear, and the individual's possibilities in that direction will become very limited. The child's talking instincts will be transformed into habits if sound models are at this period continually furnished him. The appearance of these impulses are of significance to the educator because they represent possibilities for development. The teacher should know the nature of these instincts and when they appear. And if they represent a possibility which is desirable in the ideal adult they should be laid hold of and secured. If they represent possibilities not desirable they should not be given room to function. All stimuli, models, and suggestions calling them into play should be carefully avoided. And through disuse they will fade out and disappear altogether. So after all the environment can lay hold of only those tendencies in the individual which are present, and to a great extent what the individual shall be as an adult, depends as much upon his own tendencies as on the stimuli which call them into action.

The teacher needs to know what are the individual's tendencies as well as the environment to which he is to be adjusted. When there is nothing in the environment to provoke to action certain latent tendencies they can never develop, and it is as if they never existed. On the other hand, the teacher should ascertain whether certain tendencies exist, else much effort may be put forth with fruitless results. The teacher, if he reckons with the material in the child, the ideal adult, and the means at hand for developing him into such, is then only on a basis for doing good work.

Much of the school work is merely a lot of intellectual legerdemain which is entirely foreign to the child's make-up, and many of the things it is concerned with are unfamiliar to the child's experience and not concrete enough to be a basis for rich concepts. There is a continual substitution of hazy imagery, oftimes of mere word pictures, for definite, tangible realities. School rooms at best are unnatural and artificial learning places. During the first half of the school life the school room ought to be well stocked with objects from the neighborhood, which ought to be, so far as it is necessary to do their work in the school-room, the objects concerned with during such exercises. Primary education, in the nature of things, must be very concrete. It ought to concern itself with the immediate properties of things—naming, comparing, describing. The objects of study ought either to be actually present or so familiar to the child that there are definite images in the mind. The aim of the teacher in primary work, should be to stock the minds of the children with first-hand knowledge of the qualities of things. In the study of history and geography, where the objective setting cannot always be actually pres-

ent, the teacher should lay sufficient stress on the vividness and definiteness of the learners' imagery. He should aim to develop in their minds the power to hold complex facts until they can picture their relations. They should be taught to represent the looks of the country studied, mountains, valleys, industries, so that they may form exact and detailed images of their relations. They should see the country as a traveler sees it. They should be led to travel over it in imagination so there may be a thread of adventure and reality connected with it. This attaches a feeling of experience and vitality to it. The school should be as nearly as possible a model of real life and natural conditions.

If we could only get teachers to understand the importance of the two sets of imagery involved in the teaching process! The child has an image in his mind, the teacher has another. The teacher may involve some general term, e. g., mankind, in his description which he takes for granted is well comprehended by the child. But when he stops to think how a concept grows he will see the futility in using such terms. He must clearly apprehend the child's image of a thing and when he has that in mind there is no difficulty. He can then develop that image in any way he desires. He is, so to speak, an artist modifying the child's image, now here, now there until it represents what his purpose was to make of it.

Teaching is too abstract. Only to the degree that we can keep imagery before children's minds can we stimulate their interests and control their thinking. If all the new things we present to our pupils were so coördinated as to appeal to their personal experience, interest would be aroused, knowledge would become real, and discipline natural. School room work ought in every case to solicit the child's past experience and interest. Arithmetic problems can all be personal, associated with some interest. I do not mean to insist that the child's original interests should be maintained in the school room activities. If the teacher has the proper grasp of their imagery, or way of regarding and valuing things, he can manipulate those interests and direct and develop them in such a way as to meet the needs of the community for which the child is brought up. There ought to be a personal reference in every geography and history lesson. Historical characters, when made an object of examination, opportunities, responsibilities, short comings, etc., should be taken into consideration and the child can always be led to decide what under the circumstances he would have accomplished, or how he would have acted. In geography, commercial activities should be entered into by children. Let them trade, buy, sell, produce. Show them future opportunities and essentials in success. Put them in situations and let them decide how they would feel and act. In this way they will grow up with a full sense of opportunities and responsibilities. In so many schools real life activities are barred. The school is a sort of cloister where all the activities are artificial and the child gets no sense of their application to real life. The play ground is the only redeeming feature. It is by no means a breach of propriety for the teacher to participate in the games on the play ground or to

try to associate the activities within the school room with those without. All of the child's interests and facts of his mind, instead of being juxtaposed in such a way in the learning process that they cannot have any mutual bearing on each other, should be organized, cross-tied, coördinated in such a way that they may represent a completely assimilated system, so that when he is called upon to think and act his whole intelligence is involved. Through specialization in teaching the knowledge of the child in one subject is likely unrelated to his knowledge in other subjects; the connections are not pointed out and related in the child's experience. The child gets an apperceptive mass for the knowledge of each subject and consequently his judgment must be narrow and devoid of common sense. There is lack of tact, of insight, of power to construct and of resourcefulness, and of independence of thought and intelligent application. If space would permit, it might be shown that all of these deficiencies have their source in improper training in the power to represent.

To sum up—it was attempted to show in the above discussion that a comprehensive conception of what education really is, implies a knowledge of the factors involved in the progress and civilization of the race; and that a knowledge of these factors, made possible through a study of history and ethnology, will give the educator insight and will go far toward the efficient development of a science of education. What education is, is expressed in the difference between the ideas and notions about things, of the savage, or the child mind, and those of the most highly civilized minds. All human consciousness is in the form of images present to it. The imagery present in the child's mind is largely that which is immediately impressing the senses, while the advanced mind is almost entirely occupied by representations not present in senses. Education begins by developing the power to bring up images which were previously present to the senses. This power is developed by means of language. Language is a system of arbitrary vocal responses which are associated with the objects of the world and their relations. The images of these objects can be brought up independently of their presence to the senses by merely making the associated responses. Communication between minds is by means of imagery, brought up by means of conventional responses. Communication is efficient only in proportion to the likeness of the imagery called up by the responses. The teacher oftimes in his language implies the concept, whereas the image produced in the child's mind is specific. The teacher cannot therefore do effective work until he can, in each case, appreciate the child's imagery and communicate with it in terms of its imagery. He must be able to take an inventory of the child's mental furniture. Our actions depend on our objective environment so long as there is no mental imagery. As soon as there is mental imagery it will serve as stimuli and will consequently modify and control our actions. By appropriate exercises and suggestions the teacher can modify the child's imagery and consequently its conduct. Good teaching implies giving the children a sense of what they may reasonably accomplish—aims, desires,

motives. So many children work blindly of purpose. Images of their own possibilities are never held before them. They are never taught to realize that what other men have accomplished (those whose history they have studied) they may also accomplish. Conduct is controlled by the imagery of the mind, and success in discipline, therefore, is the ability to keep before the pupil's mind images which produce favorable actions. The images should be of things to be accomplished, and therefore the teacher should have no don'ts. Success in teaching depends on the efficient development and control of the pupil's imagery.

EMERSON'S EDUCATIONAL PHILOSOPHY.

By John Madison Fletcher.

Introductory—The two main points of view and the difficulty of arriving at them.

The two standpoints from which one may make a study of Emerson as an educator, namely, that of his educational views, and that of his educational influence, present difficulties equally hard to meet. Thomas Wentworth Higginson says (1): "Renan's fine remark about the works of Marcus Antonius, that 'they will never grow antiquated because they embody no dogma,' might have been made for Emerson." And further, being led, no doubt, by the fact that Emerson wanders very frequently into self-contradictions, he tells us that no two observers give us the same Emerson. In the matter of Emerson's educational influence an even more difficult task is presented. For to determine with exactness the influences that may have brought about a particular movement, or status, involves intricacies very similar to those that might be expected in undertaking to quantitatively account for the velocity and the direction of a current of air without the means of ascertaining the part played in it by the over, under, and side currents. Prof. James, in answer to a request for suggestions as to how to arrive at some adequate notion of Emerson's influence upon Harvard University, says that such things are altogether underground, and therefore can scarcely be arrived at. In order to be able to weigh accurately and fairly the amount of influence exercised by an agitator, one should not fail to give recognition to the operation of influences outside of him, such as can be found in the religious, the political, the educational, and the social conditions. Perhaps in no field of research are men more guilty of post-hoc-ergo-propter-hoc errors in argument than in that which has to do with biography. Beyond cavil, Emerson was a product as well as a factor. He was born in the dawning days of the New England Renaissance, a time when students were beginning to question as to whether there were not more fields open to them than the old trio of theology, classics, and law, which were for so long termed the "learned professions." (2) And yet, though we may admit that this new birth in thought might have come without the influence of his life, his voice, and his pen, we must concede that Emerson was more than a mouth-piece. He was the chief representative and great exemplar of an innovation which was to result in breaking the chains of tradition which had held American minds hard and fast for two hundred years, and not only was

(1) Outl., Vol. 74, p. 223.
(2) See A Literary History of America. Barrett Wendell, p. 325.

he to help free the American mind, but, since the eyes of Europe have been for some time turning westward for methods in education, his influence may be said to be world-wide. An eminent English educational authority has recently paid so marked a tribute to the part played in the educational movements of the world by Emerson that it is deemed worthy of quoting in extenso in this connection. The article referred to is one by Michael E. Sadler of London, first published in a London journal and later in The Educational Review, December, 1903. Dr. Sadler says: "Emerson, however, has had extraordinary influence on some of the men who have been leaders in the new movement in American education. The elective system of studies, which under President Eliot's authority has worked so great a change in the programmes of American universities and secondary schools, is a practical outcome of Emerson's teaching. And this characteristically American theory of school curriculums is beginning to prevail in Europe as well. It is a disintegrating force. It breaks up the solid masses of the traditional curriculums of the Old World just as the Atlantic waves break up the rocks on the west coast of Shetland. It challenges the old conception of 'general culture,' which has had so powerful an influence on the plan of studies in the secondary schools of Germany. It asserts the claims of new forces of culture, hand-work as well as head-work. It assails the privilege of classical education as we know it in our English public schools, and as it has been known in the most famous secondary schools of France. It takes as a unit of organization a particular study like Latin or algebra, instead of a traditional combination of studies. It aims at offering such a variety of possible groups of subjects of instruction as to meet the different intellectual needs of types of ability not less than the different practical requirements of different callings. Its strength lies in its faculty of swift readjustment to changing demands, and in its power to meet a bewildering variety of needs. Its weakness lies in its lack of the steadying force of an authoritative discipline, and in its preferring liveliness and brisk variety to steady-going thoroughness on conservative lines. But the hour has struck for change. The American influences are penetrating every year more deeply into the heart of European education. And, wherever they penetrate, they remind us of Emerson. * * * Much that is most vigorous in the educational life of the English speaking peoples at the present time is Emersonian unawares. * * * Into English education Emerson's influence has come in two waves. The first broke on us about forty years ago. It was one of the causes which led up to Mr. Forster's Elementary Education Act of 1870. No one can read the newspapers and magazines of the critical years before 1870 without being struck by the importance attached by educational reformers in Great Britain to the example and experience of New England. Those of our educational leaders who had faith in democracy, and therefore wanted to give the best educational opportunities (as contrasted with those other guides, like Mr. Lowe, who had unfaith in democracy, and therefore wanted to make the

What Dr. Sadler says of Emerson's influence upon England.

best of a bad business by means of schools), were inspired, more than they knew, by the influence of Emerson. The second wave of Emerson's influence is breaking over us now. Our minds are open to it for the same reasons that they are open to the influence of Wordsworth. But English educational ideals are being influenced at the present time, not so much by Emerson's actual writings as by the Emersonian tendencies which have realized themselves in American school curriculums and in the American belief in education."

Emerson's place as an educator defined.

Emerson's place as an educator must in the very beginning be defined. It is also well to decide whether or not he is in line with modern educational movements and the progress of thought in general. Some might ask if it be not a backward step to leave the commonly accepted method of laboratory research and turn to one who approached this question of education, as indeed all others, from the fundamental, philosophical standpoint, rather than from the tedious observation of facts; by a deductive method, in other words, rather than by inductions. Is Emerson to be placed in the category of those who, while they may have contributed to the advanced thought of their day, have nevertheless been outgrown in the process of time? Emerson without doubt was an educational philosopher and as such what claim has he in modern education?

Emerson's point of view defined by Munsterberg.

It may also be well just here to ask ourselves what part philosophical methods are likely to play in the researches of the future. These questions are discussed by Professor Münsterberg of Harvard in the first issue of "The Journal of Philosophy, Psychology and Scientific Methods," January 7, 1904. In this he says: "A reaction against the narrowness of mere fact-diggers has set in. A mere heaping up of disconnected, unshaped facts begins to disappoint the world; it is felt too vividly that a mere dictionary of phenomena, of events and laws, makes our knowledge larger, but not deeper, makes our life more complex, but not more valuable, makes our science more difficult, but not more harmonious. Our time longs for a new synthesis, and looks toward science no longer merely with a desire for technical prescriptions and new inventions in the interest of comfort and exchange. It waits for knowledge to fulfill its higher mission, to satisfy our ideal needs for a view of the world which shall give unity to our scattered experience. The indications of this change are visible to everyone who observes the gradual turning to philosophical discussions in the most different fields of scientific life. When after the first third of the nineteenth century the great philosophical movement, which found its climax in Hegelianism, came to disaster in consequence of its absurd neglect of hard solid facts, the era of naturalism began its triumph with contempt for all philosophy. Idealism and philosophy were stigmatized as the enemies of true science, and natural science had its great day. * * * But just when the climax had been reached and all had been analyzed and explained, the time was ripe for disillusion, and the lack of philosophy began to be felt with alarm in every quarter. For

seventy years there had been nowhere so much philosophizing going on as suddenly sprung up among the scientists of the last decade.* * * The time seems to have come again when the realistic wave is ebbing and a new idealistic tide is swelling, just as they have alternated in the civilization of three thousand years."

Emerson has had a direct relation to education in America.

Emerson has had a far more direct relation to educational matters than the mere discussions of problems bearing thereupon to be found throughout the body of his writings. Holmes says in his life of Emerson that he began life "as a school-master, and ended as a teacher in a school house which had for its walls the horizon of every region where English is spoken." During the years 1868, 1869 and 1870, he delivered at Harvard University a course of lectures on The Natural History of the Intellect. These lectures have never been embodied in any printed form. In 1874 he was nominated Lord Rector of Glasgow University by the independent party among the students, receiving five hundred votes against seven hundred received by Disraeli, who was elected. It is to be seen therefore that Emerson cannot be narrowed down to being merely a propounder of some decadent system of philosophical speculation in education, but that he is not transcending the bounds even of his peculiar field of labor when he assumes the role of an educator.

The Over-Soul theory is fundamental in Emerson's educational and philosophical views.

In taking up Emerson's general educational views, first of all must be mentioned his conception of the Universal Mind or Over-Soul, for surely this is fundamental with him. The thought appears throughout his writings, and seems to govern his ideas about man and the universe. It is spoken of as Reason, Spirit, Creator, Father, God, Divinity, Nature, and the like; but the two most common names are Universal Mind, and Over-Soul. He bases his philosophy on the belief that around and within man, subject to his command and forming the very source of his life are spiritual resources as inexhaustible as the boundless space above him. The measure of one's mental capacity is the extent to which these resources have been appropriated. (1) Greatness consists not so much in the fertilization of and the drawing out of the powers inherent in man as in his reaching out from his peculiar "coigne of vantage" and appropriating those things which are his heritage, and not his only, but the heritage of mankind. (2) "Every man is an inlet to the same and to all of the same. He that is once admitted to the right of reason is made a freeman of the whole estate. What Plato has thought, he may think; what a saint has felt, he may feel; what at any time has befallen any man, he can understand. Who hath access to this universal mind is a party to all that is and can be done, for this is the only and sovereign agent." All characters would be the same were they all subjected to the same influences or stimuli, among which are to be reckoned those due

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Note.—The references are to the Riverside text.

(1) Soc. and Sol., p. 283. (2) Es. 1st Ser., p. 9.

to individual inheritances and peculiar environs. When, though these "incrustations of time," the soul can break and launch into its wider realm, the highest and the lowest must meet upon equal terms. The thought that thrilled in Shakespeare's breast, and that may have found utterance in Lear or Hamlet, is no more his property than it is that of a street Arab of London, who may be capable of understanding it. The sublime conceptions of Raphael and Angelo belong to him who can be led to an appreciation of them. Beethoven and Mendelssohn belong to all who can interpret them. A school boy of to-day thinks of the law of gravitation not as something upon which Newton has any claim, but considers it his own. The great maxims and philosophies of the master minds have found universal acceptance and have lived only when they have been the unexpressed, unembodied thoughts of humanity. No one can boast of any peculiar claim on mental resources, but such things belong to the commonwealth.

"I am owner of the sphere,
Of the seven stars and the solar year,
Of Cæsar's hand and Plato's brain,
Of Lord Christ's heart and Shakespeare's strain."

Chapman thinks that Emerson disregards the idea of growth.

In an essay on Emerson, Chapman says: "We miss in Emerson the underlying conception of growth, of development, so characteristic of the thought of our day, and which, for instance, is found everywhere latent in Browning's poetry. Browning regards character as the result of experience, and as an ever changing growth. To Emerson, character is rather an entity complete and eternal from the beginning." This statement on the part of Chapman, while emphasizing a point well worth emphasis, yet seems as though it would merit acceptance only with a grain of modification, or else we should be pursuing a bootless task in searching the pages of Emerson for educational views, since education is nothing more than development and unfolding. But when Emerson tells us, (1) for example, that every change in the outer world writes a corresponding change upon the mind, and again (2) that "as the human body can be nourished on any food, though it were boiled grass and the broth of shoes, so the human mind can be fed by any knowledge," and again, (3) that "in all human actions those faculties will be strong which are used," and still again (4) that there are circumstances, such as those relating to political usages, rules of aesthetics, conventions, religious rites, and the like, which tend "to solidify and hem in the soul," and that it is only by quickness and sheer strength that the soul "bursts over that boundary on all sides and expands another orbit on the great deep," we wonder if he does not in his discussions of character mean to say that, while every individual soul is potentially complete, since it emanates from the one universal source, yet it is actually so only to the extent that it approaches unto this source, and that

This view disagreed with.

(1) Soc. and Sol., p. 283.
(2) Nat. Ads. and Lects., p. 93.
(3) Cond of L., p. 135.
(4) Es. 1st Ser., p. 284.

the process of education, after all, consists in a leading out of the mind from the "shades of the prison house," that begin even to "close upon the growing boy."

Individual Mind same in essence as Universal Mind, and emanates from it.

As to the relation of the individual mind to the universal mind, Emerson thinks that the two are the same in essence. Just as a dewdrop catches a little of the sun's light and acts for those who see it as a little sun in itself, so each individual appropriates and makes use of a share of the one mind world. When we attain unto a thought expressed in a book or a poem we are simply getting into the (1) "point of view which the universal mind took through the eyes of one scribe." It is not when we dig up the treasures of thoughts left us by those who have gone into unbeaten paths of truth that we become great. The true mind is the one that faces truth with naked self. There is a greatness, too, in even the lowest of humanity, could we only "observingly distill it out." "That is always best which gives me to myself." "The sublime is always excited in me by the stoical doctrine, obey thyself. That which shows God in me, fortifies me. That which shows God out of me makes me a wart or a wen." It is only by coming to one's self or to the God in one's self that there is a chance of unending growth. (2) The only man who has a message for the world is he who can preach from within himself. If he has no soul life he has no common ground with humanity. (3) Cowardice prevents men from being true to themselves, and this kind of cowardice is so common that it is only between the lapse of years that a new truth bearer comes. (4) He who has been brave enough to follow the light within, and to dive to the depths for new truth, is only one of those who has gone into "that sea whose floor of pearls is all our own." (5) There is some poetical element in the nature of all men. In spite of the fact that they are serving nature for bread, her beauty at times will overwhelm them and off they go to Niagara, the hills, the seashore or the woods. The student who concludes to prostrate his genius at the shrine of trade, who listens to the voices that allure him to the busy marts for the sake of gain, is not true to the vision that has been his. He has left the pathway which is open to him above all men. (6) "The student," says Emerson, "as we all along insist, is great only by being passive to the superincumbent spirit." The bold mind is simply one that is more surrendered, and by being so he is a leader and not a follower of mankind, until one still bolder comes, who goes on further beyond him into realms unexplored. The progress of human thought is accomplished in manner similar to that which we observe when we stand on the seashore and see a succession of waves of the same height.

Success of the student depends upon his relation to the Grand Mind.

(1) Es. 1st Ser., p. 108.
(2) Nat. Ads. and L., p. 139.
(3) Nat. Ads. and L., p. 140.
(4) Nat. Ads. and L., p. 157.
(5) Nat. Ads. and L., p. 164.
(6) Nat. Ads. and L., p. 176.

Soon there will come another whose lofty crest breaks upon the shore far beyond any that have come. After a while the sea itself has crept to where the loftiest swell had reached. (1) Trusting the universal sentiment of mankind is the only hope of civilization and reform. (2) "This circumambient soul which flows into him as into all, and is his life, has not been searched" by man, but this field of knowledge, which is infinite, is delivered into his hands not in fee simple, but in usufruct. Nor must he contravene the "increasing purpose," which runs through all, or else the powers that be will be found fighting against him instead of for him. (3) The soul of the Infinite is poured into human life through the thoughts of men, which thoughts are the basis of our life. (4) Obedience to the universal rather than the individual mind constitutes the foundation for moral discipline. (5) The great object of education is to acquaint the youthful man with himself, to inspire in him self-trust, to acquaint him with his relation to the Grand Mind. Everything teaches the infinitude of man. (6) Though the senses of men are generally opened before their minds, and though their minds are so often obstructed and delayed, every young man is a potential genius. (7) The scholar must hold lightly every opinion, every tradition, every person, if they answer not to the voice within him.

(8) The divine faculty which has created all things is the same that dwells in us. The poet is simply the great seer of truth, and taking the meaning of poet in its broadest significance, he is only a teller of news. (9) Great poets feel that they have simply found their verses, not made them. (10) The right obedience to the human soul is the chief necessity in education, and upon it hinges all our power as well as our happiness, while obedience to its mandates renders it all the clearer and grander. (11) Greatness is but the fulfillment of natural tendencies which may be found in one form or another in every individual. It behooves the scholar to refuse to allow himself to be laughed out of, to be terrified or bought off from the path which his genius traces for him to traverse. (12) There is a tendency especially to be found in young writers to discount their own thoughts and to distrust this soul within them and be satisfied merely with representing the mind of others; a thing which they frequently fail to accomplish, and when accomplished, proves to be a bar to the realization of their individuality and consequently to the attainment of true greatness. Man is only a medium of thought and every thought which has found way into his mind from the universal mind must needs pass out again colored with his own individuality and warped to suit his mental bias. (13) Emerson asserts the existence in the mind of a law corresponding to Michael Faraday's law of Diamagnetism.

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(1) Nat. Ads. and L., p. 263.
(2) Lects. and Bio. S., p. 85.
(3) Lects. and Bio. S., p. 88.
(4) Lects. and Bio. S., p. 96.
(5) Lects. and Bio. S., p. 134.
(6) Lects. and Bio. S., p. 147.
(7) Lects. and Bio. S., p. 274.
(8) Lets. and So. A., p. 45.
(9) Soc. and Sol., p. 53.
(10) Lets. and Soc. Aims, p. 281.
(11) Rep. Men, p. 155.
(12) Lets. and Soc. Aims, p. 293.
(13) Lets. and Soc. Aims, p. 290.

that is, that every chemical substance has its own and a different polarity. Every mind, he says, "has a new compass, a new north, a new direction of its own, differencing its genius and aim from every other mind; as every man, with whatever family resemblances, has a new countenance, new manner, new voice, new thoughts, and new character." But he is not by this individual set of characteristics set off from the human race, but shares with them "the gift of reason and moral sentiment," while "there is a teaching from within which is leading him in a new path, and, the more it is trusted, separates and signalizes him, while it makes him more important and necessary to society." (1) In art we must recognize the truth that "the universal soul alone is creator of the useful and the beautiful," and that if the individual soul hopes to create aught of usefulness and beauty it must do so through the medium of and by submission to this creator. (2) "Herein is the explanation of the analogies which exist in all the arts. They are the reappearance of one mind, working in many materials to many temporary ends. Raphael paints wisdom, Handel sings it, Phidias carves it, Shakespeare writes it, Wren builds it, Columbus sails it, Luther preaches it, Washington arms it, Watt mechanizes it."

The soul should be given freedom.

(3) There is such a thing as over-civilization, a condition when the overwhelming mass of books, theories and opinions tends toward beclouding rather than enlightening, and submerging rather than giving freedom to the individual mind. In such a time the world feels the need of the souls who are heroic enough to institute a revolt in order to break the bonds of convention and free the mind of the world from the manacles of tradition; such a need, for example, as has been answered in the world of action by Napoleon, in the world of letters by Gœthe, in the world of religion by Luther, in the world of science by such as Darwin, Huxley, and Spencer. (4) The simple and pure souls only can see the rising tide of truth which comes to mark an advance step in human progress. These, if they be brave, will act as its heralds and soon society appropriates it, builds her institutions upon it, and settles down again to await the coming of another.

Mind only is creative.

Emerson thoroughly espouses the idealistic point of view and as a matter of course assumes that mind is fundamental in all things. The whole of nature is but an embodiment of the thoughts of the creating mind. With the Erdgeist in Faust he would say:

" 'Tis thus at the roaring Loom of Time I ply,
And weave for God the Garment thou seest Him by."

(5) Emerson emphasizes again and again his conception of all material creation as "mind precipitated," and says that back to its former state the volatile essence of nature is constantly returning. In this may be seen the

(1) Soc. and Sol., p. 53.
(2) Soc. and Sol., p. 55.
(3) Rep. Men, p. 275.
(4) Miscel., p. 188.
(5) Es. 2nd Ser., p. 19.

reason for the close relation between mind and matter. The origin of words gives evidence that they were once mere pictures of some fact in nature. Everything of beauty in nature "pre-existed or super-existed, in precantations," and he who has ears tuned for their music may catch the notes as he comes near. As the individual mind is but a minute miniature, however distorted it may often be, of the Great Mind, whatever is real in life to humanity must depend for its reality upon mind. Beauty exists in us. The apperceptive powers of the human soul alone must determine the quality of things. (1) There is not so much difference between landscapes, but there is a great difference between the observers. Not keenness of intellect alone, but much more, is required to discern things about us. To study nature with the spirit of selfishness and not of sympathy is to at once surrender the shibboleth that admits you into her treasure house. (2) A painter cannot paint until he has transformed himself into his subject, even into the trees and the rocks. (3) The most abiding forms of art and architecture are those which have come from the spiritualization of the sights and the crystalization of the forms found in nature, as the picture of the cherub from the clouds, the Gothic church and Greek columns from the forest trees, the Saxon arches from the snow burdened boughs hanging low, the Gothic stained glass windows from the transformation of sunset tints as they shot through the intertwining limbs of winter woods, the Oxford and English cathedrals from the trees and ferns of England, the slender shafts and capitals of the Persians from the lotus and the palm. (4) The lack of this sympathetic interpretation changes our botanists into mere dictionaries of names, and our ornithologists into lifeless individuals, boasting of nomenclature, who do not compare with the barefoot boy who trudges over the meadows and by the seashore in perfect fellowship with the birds, the rocks and the flowers, and yet is unable to name them. The difference between the wise and the unwise man is that the latter wonders only at what is unusual, while the former sees a miracle in the commonest sight. Only a Ruskin can see the jewels in the filthy London mud; only Shakespeares can appreciate the "long masquerade" of the crowded streets. (5) To the untutored eye and the unsympathetic heart the scenes of nature when the cold of winter time has left the meadows brown and bare, and has stripped the woodlands of their verdure, locking up the laughing brooks with ice, there seems to be naught but the voice of sadness. But he who has this seeing eye, hearing ear and understanding heart, can comprehend the beauty in every changing aspect, and instead of thinking of any season, or of any spot, as bereft of beauty, the wise can see in all of nature's shifting scenes but a variation which serves simply to enhance the beauty of the whole. (6) We have power to build our own world, and so completely can we build it that all the disagreeables will dis-

(1) Es. 2nd Ser., p. 170.
(2) Es. 2nd Ser., pp. 80 and 172.
(3) Es. 1st Ser., p. 21.
(4) Cond. of L., p. 267.
(5) Nat. Ads. and Lects., p. 24.
(6) Nat. Ads. and L., p. 24.

appear. (1) "That country is the fairest which is inhabited by the noblest minds." (2) If there be grandeur in us we can see grandeur in the very lowest. Emerson would have us stand as transfixed with wonderment at the star-sprinkled heavens as if that glorious exhibition came only once in a thousand years; and not only should the frequency of a sight fail to take away any of its value, but nothing should to us be so insignificant that it would become common. The wise and poetical soul should be able to say with Emerson:

"Let me go where'er I will,
I hear a sky-born music still.
'Tis not in the stars alone,
Nor in the cups of budding flowers,
Nor in the red-breast's mellow tones,
Nor in the bow that smiles in showers;
But in the mud and scum of things
There always, always, something sings."

The very institutions of man, his church, his state, and all his social conditions existed in the mind of individuals before they were realized in actuality. The state is created by and for the individual, and hence can never rise higher than the individual, but must ever follow after him, and hence the importance of proper means of education. (3) "We shall one day learn to supersede politics by education. What we call our root and branch reforms, of slavery, war, gambling, intemperance, are only medicating the symptoms. We must begin higher up, namely in education."

If the mind of man be an emanation from the mind of God, and if mind alone be the creating force, it should be valued and respected, and in order that it may do its work it should have the greatest possible freedom. The oration delivered by Emerson before the Phi Beta Kappa Society of Cambridge, in August, 1837, on the subject, "The American Scholar," has been styled our Intellectual Declaration of Independence. It embraces fundamentally Emerson's educational philosophy, and hence deserves as full a discussion as the nature of this article will allow, which can only be, however, a brief synopsis of the salient points contained in it. The undesirable feature of having to discuss in this synopsis certain points which will meet with a fuller treatment elsewhere cannot be avoided as a matter of course.

The keynote of oration on the American Scholar is Freedom.

In practice, as in doctrine, Emerson accepted the ipse dixit of no one as final authority, whether they may have been clothed with civil authority or in ecclesiastical habiliments; whether they may have been classed in the category of the secular or the sacred. What Dr. Fairbairn says of Herbert Spencer may have been said with equal propriety of Emerson, namely, that (4) "Like Mill, Spencer faced the universe for himself and tried to read, to conceive and to state its mysteries in the terms he himself best understood."

(1) Es. 1st Ser., p. 243.
(2) Nat. Ads. and L., p. 79.
(3) Cond. of L., p. 135ff.
(4) Cont. Rev., Jan., 1904.

With a confident belief in the oneness of humanity, in that all mind has its origin in, and draws its life from, the one eternal, inexhaustible source, Emerson gives out the watchword "Freedom," which watchword is the keynote of Emersonian education.

(1) To Emerson it is a thing worthy of rejoicing that, in spite of the rising tide of materialistic interests of America, a tendency which he even in his day seemed to feel with more than ordinary force, there always survives some love of letters, which gives proof that there are deeper instincts of finer quality, which, though oftentimes relegated to the rear in the hurry of material interests, can never be annihilated. We in America are beginning to prize our own innate resources. (2) The time has come when we no more consider it to be essential for those who hope to attain unto learning to worship in European Jerusalems, but in spirit and in truth. The earth shifts upon its axis so that what is now our polar star may not be so always. Athens may have once been the intellectual polar star of the world, but the spirit by which it was animated has left it to crumble and decay.

Travel not necessary to culture. The individual soul is the chief thing.

Under the present system of labor division, brought about by the complexity of modern life, it seems a difficult thing for man to avoid being transformed into an automatic machine. The mere performance of some minor function is not conducive to making man complete. We are becoming partial men, pieces of men. Those who should be "men thinking" have been metamorphosed into mere complications of reflexes and habits. Herein consists the ever increasing task and obligation of the scholar. He must be the thinker, and no less the thinker than the actor, for humanity.

Man thinking is the highest type of man.

The resources which the scholar has at his command, or the influences which afford his means of growth, are enumerated in this oration as being, (1) nature, (2) books, or the past, and (3) actions. What these influences are and how they should be appropriated, with a final word on the scholar's duty to the world constitute the basis of the oration.

Nature, Books and Action are the three great educative means.

So much emphasis does Emerson put upon the influence of nature in education that one cannot help thinking of him as the American Wordsworth in that respect. "Science," he says, "is nothing but the finding of analogy, identity in the most remote parts. Colleges and books only copy the language which the field and the work-yard made." The scholar then may know that, when he visits this treasure field he will find there life and truth, and not a counterfeit or a second-hand version of it. With nature he may catch some of the mind that has been precipitated into the forms which men can perceive. Indeed, he is only coming to himself when he comes to nature, so that the ancient maxim, know thyself, is identical with the modern, study nature.

1. Nature.

(1) Nat. Ads. and Lects., p. 83, "The American Scholar."
(2) See Es. 1st Ser., pp. 71, 79 and 80.

It is in his view of books, authorities or the past, that Emerson has made his most unique and his greatest contribution to education and thought in general. The ideas along this line, and the kindred ones growing out of them, which are found to occupy a place of no inconsiderable importance throughout his writings, are no doubt the ones which have been most felt in the educational world, particularly in New England, where they have operated to bring about whatever changes Emerson may be responsible for in the elective system of college curricula.

2. Books.

Books must not be considered to be identical with truth. They are merely the representations of the points of view of individual observers. The first scholar looked out upon the world, received it into himself, and sent his version of it back again. It depends upon how much of simple truth and how little of his own peculiar mental bias, how little of the influences of institutions, which have contributed to his point of view, and of the spirit of the times, as to how long his utterances will live and pass muster in the roll-call of the ages. If we but use authorities as vantage grounds upon which to stand that we may reach, and if we let them die when they have served out their time, then the theory of books may be commended as noble, but the moment we apotheosize a writer because he is a creator, or canonize him as a saint infallible, then books become pernicious guides and we are transformed from manhood's royal estate into that of ignorant worshipers at the shrine of the gods which we ourselves have created. Books used as food and fuel for thought are good, but as a ne plus ultra they become a means of intellectual starvation. The book worm could be spared without serious detriment to the progress of humanity. "Meek young men," says Emerson, "grow up in libraries, believing it their duty to accept the views which Cicero, which Locke, and Bacon have given; forgetful that Cicero, Locke, and Bacon were only young men in libraries when they wrote these books." Of this strong and characteristic utterance Thomas Wentworth Higginson says: "I suppose that all the accumulated sentences ever spoken before in America had not done so much to induce young students to think for themselves as that one sentence. To me I know the whole college library became my servant, not my master, from that moment." (1) To Emerson the student who is a slave to the use of books is like the parasite or infant mammal that spends its life in a process of suction. A little store of facts is not the end of college education. If what information an ordinary student can acquire in an ordinary college course were all that he could ever get, his fund would be limited indeed. But if by some means he can catch an inspiration, there are few circumstances in after life that will deter him from the attainment of full mental development. Lack of inspiration may be assigned as the chief cause of the fact that out of many graduates so few ever continue in scholarly pursuits.

(1) See Lets. and Soc. Aims, p. 169.

In reference to action as a means of education, Emerson argues as strongly if not as scientifically as would Professor James in discussing the completion of the "cycle of activities," manual training and the like, in a treatise on Educational Psychology.

3. Action.

"Action," he says, "is with the scholar subordinate, but it is essential. Without it he is not yet man. Without it thought can never ripen into truth. * * * Inaction is cowardice, but there can be no scholar without the heroic mind. The preamble of thought, the transition through which it passes from the unconscious to the conscious, is action. Only so much do I know, as I have lived. Instantly we know whose words are loaded with life, and whose not." * * * "So much only of life as I know by experience, so much of the wilderness have I vanquished and planted, or so far have I extended my being, my dominion." * * * "The true scholar grudges every opportunity of action passed by, as a loss of power." Action brings power, furnishes the raw material out of which thoughts are fabricated, enlivens the vocabulary and is indeed the foundation of complete living. Thoughtful action is complete living; either thinking only or acting only is incomplete. The scholar, the man thinking, must be content to live and labor, in obscurity if need be, and without immediate reward. No one can say that he was born too late. Not all the needed reforms have been instituted nor have all fields of knowledge been explored. There is much left to be done and vastly more lies within the reach of our powers than we can think. The world is yielding and pliant to him who brings to bear upon it the God-like thought within him. "To ignorance and sin, it is flint." To alter matter is no great achievement; he alone is king who turns the current of sovereign thought. Men are not men without the admixture of activity and thought; they are manikins. The chief business of the world and the final end of creation is the building of man, for "if the single man plant himself indomitably on his instincts, and there abide, the huge world will come round to him."

In this connection Emerson gives emphasis to the dependence of the scholar upon the Universal Mind, the great public power from which, by abandonment to it, he may draw his strength so that his word becomes thunder and his life a power (1). The poet, to his mind, is simply one who is more capable than other men of this ecstacy, and hence they have ever been the beacon lights of the human race, the mighty heralds of truth, and will ever continue to be. The greatest tragedy in the human race is that, like a wanderer in a blinding snow storm, perishing near his cottage home, we wear ourselves away in impotence when in very reach of infinite resources. If men yield to convention, to environment, to circumstances, they become then not creators, but creatures. No one should be able to predict what we shall say or what attitude we will take on questions by knowing merely to what section of country we belong, or under what influences we have been brought up.

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(1) See Es. 2nd Ser., p. 30.

The might of an idea, "upon which," says Ten Brink, "the intellectual progress of mankind essentially depends," is to Emerson's mind the most potent factor in the evolution of the race; not wealth, not institutions, not armies, but ideas, thoughts, products of creating souls. (1) "Beware," he tells us, "When the great God lets loose a thinker on this planet. Then all things are at risk. It is as when a conflagration has broken out in a great city, and no man knows what is safe, or where it will end. There is not a piece of science but its flank may be turned to-morrow; there is not any literary reputation, not the so-called eternal names of fame, that may not be revised and condemned. The very hopes of man, the very thoughts of his heart, the religion of nations, the manners and morals of mankind are all at the mercy of a new generalization. Generalization is always a new influx of the divinity into the mind. Hence the thrill that attends it." Old states, old religions, old cultures have their day and cease to be. They may leave little fragments as humanity keeps its onward march, scattered here and there, "as we see flecks and scraps of snow left in cold dells and mountain clefts in June and July." But they have passed their period of service and the torch must be passed over to the next runner, whose limbs are fresh and unwearied, for the race. Often there rises in the world a far-reaching mind which is able to extend the range of human vision far beyond what it has hitherto attained, and in the extravagance of our praises we are wont to grant to him the credit of having circumscribed the very limit of knowledge. But in the course of human events, there comes another who, standing upon the pedestal of the past, reaches into undiscovered lands. There is, therefore, no such thing as an ultimate generalization, but that which seems so is only a beginning of a new series. Durny, on the French Revolution, says: "It is a law of humanity that all new life shall be born in pain." Emerson says that it is not conducive to peacefulness of mind to be born when the old is passing and the new has not yet fully risen. This is the time of scholarly unrest when thinkers everywhere are asking, "Where is truth?" As an answer they receive only an echo from out the Sybyl cave. When finally some bold spirit has caught a glimpse of new truth, it comes to those who have been dwelling in the old "like an abyss of scepticism." "But the eye soon gets wonted to it, for the eye and it are the effects of one cause; then its innocency and benefit appear, and presently all its energy spent, it pales and dwindles before the revelation of the new hour." (2)

Ideas alone are mighty.

Ideas never cease to grow.

The Sphinx once asked what the world stood upon. The answer came that it was supported by Atlas; he stood upon the back of a tortoise, which in turn, stood upon the base of a cone, and this, ending at its apex in a point which had no dimensions, could have no support. Sir Isaac Newton answered that it was held in place by gravity. Now the Sphinx is asking what

The circle of knowledge constantly widens.

(1) Es. 1st Ser., p. 288.

(2) See Malloy in Arena, Jan., 1904.

is gravity? Thus continues the ever-widening process of wisdom. Truth to Emerson is divine, and therefore limitless. He would place in the same category with those whose questionings were put to rest by the first answer given by the Sphinx all those who will accept any general law, as that of evolution, for example, as a solution to the riddle of the universe, as a final conclusion of the whole matter and the Ultima Thule of reason. Only that which is divine, thoroughly free from human contamination and short-sightedness, can stand the test of ages. Man is too much controlled by the Zeitgeist and governed by his point of view to endure but for a day.

Never fear to contradict yourself.

(1) "When he considers that he knows to-day,
Come but to-morrow, he will find misknown."

Not only do the ages overreach each other in ever widening circles of thought, but individual minds as well are not to be bound by the shackles of reverence for consistency, but they must be brave enough to contradict to-morrow what they have said to-day. Respect is due to the inspiration of the moment. Emerson would deal roughly with the dissecting critics who Tennyson says will not allow him to say that the ocean roared without tracing the identical expression back to Horace. Dr. Holmes took the trouble to count the number of quotations Emerson made throughout his writings, and found them to be 3,393. This he thinks is the key to Emerson's workshop. "He believes in quotation," says Holmes, "and borrowed from everybody and every book. Not in any stealthy or shame-faced way, but proudly, royally, as a king borrows from one of his attendants the coin that bears his own image and superscription."

Thoughts are the peculiar property of no one. Borrowing is legitimate to a degree.

(2) "Shall I tell you," says Emerson, "the secret of the true scholar? It is this: Every man I meet is my master in some point, and in that I learn of him."

(3) As our college and university courses of study must needs be retrospective in their very nature, must base their work upon researches of the past which have been embodied and handed down to us in the form of libraries, they are consequently hostile to the mind of true genius, and our professors are only librarians.

But our colleges live too much on second-hand thoughts.

As a thorough-going idealist Emerson looked at everything in the light of its ultimate end. Things, nature, the world, do not exist in and for themselves, but they are symbolic in their nature and in destiny they are tending to something higher.

Emerson is an idealist.

Everything has to him a remote significance.

(4) "A subtle chain of countless rings
The next unto the farthest brings;
The eye reads omens where it goes,
And speaks all languages the rose;
And, striving to be man, the worm
Mounts through all the spires of form."

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(1) Browning's Death in the Desert.
(2) "Greatness."
(3) English Traits, p. 203.
(4) Poems.

(1) Not "natura naturata," or nature passive, makes appeal to Emerson, but "natura naturans," the efficient nature, which bids him see in her lowest forms, even in the very granite, a forerunner of a higher form. To speak of the progress from the granite to the oyster and from the oyster to Plato did not cause Emerson to lose any of his peculiarly high estimate of this dignity and majesty of man. Holmes says of Emerson: (2) "He throws his royal robe over a milking-stool and it becomes a throne." It may be emphasized that whatever subject he approached became transformed, even though it may have been common, into a dignity that befitted the royalty of his mind. Any common mind can see the dirt, the rocks, the trees and the grass, but only a superior soul can comprehend the beauties of a landscape. Any one can see the animal in man, count his reflexes, and enumerate the ties that bind him to the dust, but those who can see in him a creature of wider significance than that, who can appreciate the infinitude of his possibilities, are few. Holmes again said of Emerson: "He is always seeing the universal in the particular. The great multitude of mankind care more for two and two, something definite, a fixed quantity, than for a+b's and X''s—symbols used for undetermined amounts and indefinite possibilities." (3) As mind came from mind through the stage of matter, in any process of education, which is fundamentally sound, the alienation of it from matter must be avoided. (4) Nature to Emerson is simply the incarnation of a thought, and it turns to thought again as water will change from its solid to its liquid and thence to its gaseous forms. (5) The greatest minds, he tells us, have always appreciated the manifold significance of material facts. (6) There is a "supersensual utility" in the phenomena of nature which we could comprehend, but for the dullness of our constitution. Nature is merely mediate. It is to serve mankind and does so in an (I) esthetical, (II) intellectual, and (III) ethical capacity. Esthetically we have the joy which comes from beholding "natural forms." The earth, the sea, and the sky are treasure houses of beauty. (7) "Give me health and a day," says Emerson, "and I will make the pomp of emperors ridiculous. The dawn is my Assyria; the sunset and moon-rise my Paphos, and unimaginable realms of faerie; broad noon shall be my England of the senses and the understanding; the night shall be my Germany of mystic philosophy and dreams."

The mission of the world is to educate man.

The world and all it contains can only fulfill their end when they subserve the intellectual interests of mankind, and he only who lays them under tribute can hope to attain to his greatest destiny. The disciplinary value of nature upon the intellect is great. (8) "Our dealing with sensible objects is a constant exercise in the necessary lessons of difference, of likeness, of order, of being and seeming, of progressive arrangement; of ascent from

(1) Es. 2nd, p. 172.
(2) See Life of Emerson, by Holmes.
(3) Es. 1st Ser., p. 64.
(4) Es. 2nd Ser., p. 187.
(5) Es. 1st Ser., p. 10.
(6) Es. 1st Ser., p. 11.
(7) Nat. Ads. and Lects., p. 22ff.
(8) Nat. Ads. and Lects., p. 42.

particular to general; of combination to one end of manifold forces." * * * "In like manner what good heed nature forms in us! She pardons no mistakes. Her yea is yea, and her nay, nay."

(1) The ethical quality thoroughly pervades nature. (2) "All things with which we deal, preach to us. What is a form but a mute gospel? The chaff and the wheat, weeds and plants, blight, rain, insects, sun—it is a sacred emblem from the first furrow of spring to the last stack which the snow of winter overtakes in the fields." And wherever our varied callings bring us into contact with the outer world the same conclusions are thrust upon us. (3) What a searching preacher of self-command is the varying prenomenon of health!"

Emerson believed in the advantages of farm life.

Emerson was far from agreeing with the ascetic notions of Thoreau, and also from adopting the radical projects of the Brook Farm scheme, with which his name is often associated and in which he, to be sure, manifested a lively interest. Here, again adopting fundamental principles rather than experimental plans or methods, he threw, with mighty emphasis, the weight of his genius on the side of "plain living and high thinking." As the most feasible means of securing this end, and also as a means of bringing man into contact with the world of nature, forcing him to bear his part of the world's burden of toil, (4) which is God's education, and allowing space and time for the expansion of his soul, there is nothing that serves so well as the free life of the farm. Speaking of domestic reform he says: (5) "It must come with plain living and high thinking," and again: (6) "Honor to the house where they are simple to the verge of hardship, so that there the intellect is awake and reads the laws of the universe, the soul worships truth and love, honor and courtesy flow into all deeds." The life of cities and the vices that are there rampant are poison to the nobler self. (7) The artificiality of bricks and mortar cannot be compared with God's blessed "out-of-doors." (8) "Whatever events in progress shall go to disgust men with cities and infuse into them the passion for country life and country pleasures, will render a service to the whole face of the continent, and will further the most poetic of all occupations of real life, the bringing out by art the native but hidden graces of the landscape." The love of country villas, parks, campanias, seashores, and mountains, which has always clung about the hearts of men through the ages and stages of their growth tells of a close kinship and is a warning against the cutting of the sacred bond.

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(1) Nat. Ads. and Lects., p. 46.
(2) Nat. Ads. and Lects., p. 47.
(3) Nat. Ads. and L., p. 48.
(4) Nat. Ads. and L., p. 229.
(5) Soc. and Sol., p. 113.
(6) Soc. and Sol., p. 116.
(7) Soc. and Sol., p. 134.
(8) Nat. Ads. and L., p. 349.

These esthetic, intellectual and ethical values can be had only at the price of a sympathetic attitude. Rough, unholy hands will find that nature's Holy Grail of secret values will vanish at their approach. No unhallowed spirit need invade the woods, for her tutelary divinities are sure to interfere. But (1)

Sympathy necessary to securing highest good from nature.

"Throb thine with nature's throbbing breast,
And all is clear from east to west."

The child can be the leader of the man in this regard. Their souls are free from the warping influences of time, and from such things as render us blind to the beauties they see so plainly. The ignorant son of a farmer, or even an idiot, can oftentimes come closer to nature's heart than he who would invade her sacred precincts with a spirit of killing in order to dissect. Somehow, although the language of the rose may be understood by the sage as well as by the child, yet (2) "What art can paint or gild any object in after life with the glow which nature gives to the first baubles of childhood! St. Peter's cannot have the magical power over us that the red and gold covers of our first picture-book possessed." This seems beautifully concordant with Wordsworth's immortal lines:

Hence the child can see more than the adult.

"There was a time when meadow, grove, and stream,
The earth, and every common sight,
To me did seem
Apparelled in celestial light,
The glory and the freshness of a dream."

That Emerson fully appreciated the effect of surroundings as well as other influences in the formation of character, realizing as keenly, perhaps, as anyone that "we are part of all we've met," cannot be doubted. For apropos of this subject of life on the farm he says: (3) "Every animal of the barnyard, the field and the forest, of the earth and of the waters, that are under the earth, has contrived to get a footing and to leave a print of its features and form in some one or other of these upright, heaven-facing speakers." It would seem therefore that character to Emerson does involve a process of growth and can scarcely be said to be an "entity complete and eternal from the beginning."

Emerson does believe that environment has to do with one's education.

(4) Social contact may be a means of education. The interplay of mind upon mind, the real communion of soul with soul, (5) not the empty exchange of gossip, may be a means (6) of lighting the candle of the scholar's mind. Society in its highest sense we must have (lest we degenerate into boors), but men may sink as well as rise through social intercourse, so that the misuse or over-use, as well as the under-use or even lack, of these forces, may result in the creation of a boor.

Society has its value.

(1) Nat. Ads. and L., p. 349.
(2) Soc. and Sol., p. 3.
(3) Es. 1st Ser., p. 35.
(4) Soc. and Sol., p. 16.
(5) Soc. and Sol., p. 17.
(6) Soc. and Sol., p. 16.

Again without going to an extreme Emerson speaks a word in favor of solitude as a means of growth. (1) "A scholar is a candle which the love and desire of all men will light," he tells us, but again he says: "But the people are to be taken in very small doses," and changing the figure: (2) "Each must stand on his glass tripod if he would keep his electricity." If Archimedes and Newton "had been good fellows, fond of dancing, port, and clubs, we should have had no 'Theory of the Sphere,' and no 'Principia.'" They had the insulation from the current of society, which genius always feels the need of. (3) He who would attain unto literary success, who resolves to catch "Dame Fortune's golden smile," must do so at the price of assiduous waiting upon her in solitude. He must weigh in the balance the value which he places upon this success over against that of social power, one of which he must choose, not both, for one excludes the other for the most part. When we are alone with books we are then not really in solitude, for then we are in the very presence of the spirits of the writers. There are, however, minds capable of maintaining perfect solitude though they be in a throng. (4) "'Tis very certain," says Emerson, "that Plotinus, Archimedes, Hermes, Newton, Milton, Wordsworth, did not live in a crowd, but descended into it from time to time as benefactors; and the wise instructor will press this point of securing to the young soul in the disposition of time and the arrangements of living, periods and habits of solitude." (5) And further: "The high advantage of university life is of the mere mechanical one, I may call it, of a separate chamber and fire,—which parents will allow the boy without hesitation at Cambridge, but do not think needful at home."

But solitude is essential to deep scholarship.

(6) There are subjects of study which, though of great value in themselves, prove to be, in the process of acquiring, tedious and dull. From these the allurements of society can easily decoy us. Solitude throws over them a halo of attractiveness. This frame of mind, which comes through solitude, and which is so conducive to mental toil, is not the greatest among the benefits. There are (7) "Voices which we hear in solitude, but they grow faint and inaudible as we enter into the world. Society everywhere is in conspiracy against the manhood of every one of its members. Society is a joint stock company, in which the members agree, for the better securing of his bread to each shareholder, to surrender the liberty and culture of the eater. The virtue in most request is conformity. Self-reliance is its aversion. It loves not realities and creators, but names and customs. Whoso would be a man must be a non-conformist."

Among the sources of inspiration by no means the least potent to Emerson is that of solitary converse with nature. Alone and with nature we can meet truth and life face to face and are independent of man's version.

(1) Soc. and Sol., p. 16.
(2) Soc. and Sol., p. 12.
(3) Eng. Traits., p. 8.
(4) Cond. of L., p. 150.
(5) Cond. of L., p. 150.
(6) Eng. Traits, p. 34.
(7) Eng. Traits, p. 34.

(1) "The relations of the soul to the divine spirit are so pure that it is profane to seek to interpose help."

(2) "Es bildet ein Talent sich in der Stille."
Sich ein Charakter in dem Strom der Welt."

Consonant with his own ideas of the power and the (3) trustworthiness of the individual soul Emerson could not subscribe to the Procrustian requirements in college education. Life is not fixed or stable, nor indeed can be. Education is a fitting for life and when changes come in life, the old giving way to the new, adaptation to environment must follow. (4) "Culture must end in something besides headache." There is, to be sure, much of pure truth and genuine, unfading good in the contributions which the ages have brought us. (5) "We cannot yet afford to drop Homer, nor Aeschylus, nor Plato, nor Aristotle, nor Archimedes." But we cannot subsist upon these alone, for new ages bring new demands, so that man's environment is in constant transition. But, even though our environment should not change, so that the demands of adaptation would continue constant, still it would be unwise to administer the identical mental pabulum to all. There is not only a difference between each individual, but this difference is so wide oftentimes that such mental discipline as may be wholesome to one may be entirely unsuited to another. (6) "A point of education," says Emerson, "that I can never too much insist upon is this tenet, that every individual man has a bias which he must obey, and that it is only as he feels and obeys this that he rightly develops and attains his legitimate power in the world. It is his magnetic needle, which points always in one direction to his proper path, with more or less variation from any other man's. He is never happy nor strong until he finds it, keeps it; learns to be at home with himself; learns to watch the delicate hints and insights that come to him, and to have the entire assurance of his own mind."

Students should not all be forced to pursue the same college studies.

Emerson appreciated the classics, but read all his books in English when translations could be had.

Few men have ever drawn more from classical sources, or appreciated more the treasures of beauty and thought to be found there than Emerson, but he read the classics, as indeed practically all his literature, not in the originals, but in English. (7) He said that he liked to be "beholden to the great metropolitan English speech." And since the object of his reading was to arrive at the philosophy he couldn't see the wisdom or the economy in taking the trouble to work at the originals. "I should as soon think," he says, "of swimming across Charles River when I wish to go to Boston, as of reading all my books in the originals when I have them rendered for me in my mother-tongue." (8) He spoke of the English educational system as factitious, saying that

(1) Es. 1st Ser., p. 66.
(2) Tasso.
(3) Es. 1st Ser., p. 137.
(4) Es. 2nd Ser., p. 61.
(5) Lets. and Soc. Aims, p. 203.
(6) Lets. and Soc. Aims, p. 291.
(7) Soc. and Sol., p. 195.
(8) Es. 2nd Ser., p. 244.

their universities were "galvanizing dead languages into life." In 1844 he wrote: (1) "We are students of words; we cannot use our hands, or our legs or our eyes or our arms. * * * The lessons of science should be experimental. Once (say two centuries ago) Latin and Greek had a strict relation to all the sciences and culture there was in Europe, and the mathematics had a monetary importance at some era of activity in physical science. These things became stereotyped as education, as the manner of man is. But the Good Spirit never cares for the colleges, and, though all men and boys were now drilled in Latin, Greek and mathematics, it had quite left these shells high and dry on the beach. But in a hundred high schools and colleges this warfare against common sense goes on. Four or six or ten years the pupil is parsing Greek and Latin, and as soon as he leaves the university he shuts those books for the last time. Some thousands of young men are graduated at our colleges in this country every year, and the persons who at forty years still read Greek can all be counted on your hand. I never met with ten who read Plato. Is not this absurd, that the whole of the liberal talent of this country should be directed in its best years on studies which lead to nothing?"

He calls it a mistake to waste so much time and energy on classics and then drop them after college.

(2) The chief value, to Emerson, in the study of the classics on the part of the young, lies in the fact that the life they portray is recapitulated in the individual. The Grecian age, for instance, would well represent the period of growth of the body, the perfection of the senses, when the spiritual nature is yet unfolding as the body grows.

There is a recapitulation value in classics.

Born into the home of a poorly paid and hard worked New England minister, brought up in an atmosphere of plainness of life and grandeur of thought, and with a view of life which seemed ever to have belonged to him and to be a part of him, Emerson very naturally believed that true wealth consisted not in the abundance of things possessed, but in the depths of the soul life. (3) "To be rich," he says, "is to have a ticket of admission to the master works and chief men of each race." Humboldt with his thousand eyes could capture more wealth during a visit to America than was possessed by all its cotton kings and railroad magnates. (4) All forces, the sun, the moon, the stars, the earth, the sea, and the sky belong to him who has the power to claim them. Thoreau had a personal account with every flower of the woods. The day on which it was to bloom was set down with a banker's care. Him, Emerson would call rich with riches indeed. (5) "I ought not to allow any man," he says, "because he has broad lands, to feel that he is rich in my presence. (6) The man who owns the landscape has that which cannot be bought and sold and is far richer

Emerson puts the higher value on spiritual things than on material possessions.

(1) Es. 2nd Ser., p. 244.
(2) Es. 1st Ser., p. 28.
(3) Cond. of Life, p. 94.
(4) Lects. and Bio. Sk., p. 38.
(5) Nat. Ads. and L., p. 237.
(6) Nat. Ads. and L., p. 14.

than if he had only a deed to the fields. "The resources of the scholar are co-extensive with nature and truth, yet can never be his unless claimed by him with an equal greatness of mind." (1) The possession of energy is also a condition of entrance upon the right of one's inheritance. Idle fears and imaginative difficulties frighten the cowardly and keep back the slothful. (2) "He only is rich who owns the day."

The wise man is the one who can appropriate the social heritage.

As social wealth, to which individuals may fall heir, a rough enumeration might be mentioned as being all our means of moral and intellectual refinement, our social ideals, and such inventions as will enable man to transcend the bounds of his bodily limitation and strike not with the feeble strength of his arm of flesh, but with the gravity of the planets themselves as his ally; to gaze upon the world about him, not with the limited reach of his eyes, but with instruments that will enable him to bring into view the wandering worlds above him and the microscopic wonderland beneath him; to walk with feet shod with the seven league boots of electricity and steam; to think with a mind that has at its command the crystallized thought of the ages.

There are many sources of inspiration at our disposal.

Among the sources of the influences that are provocative of mental activity are given as a partial enumeration, in the essay on Inspiration the following: I, Health; II, the experience of letter-writing to those whose minds we know, and with whom we may have common thoughts; III, the periodic renewal of mental vigor, a thing to be experienced, not so much by young as by older scholars; IV, the power of the will; V, the feelings that follow certain times of day, particularly the morning hours; VI, solitary converse with nature; VII, solitude, that is, complete solitude; VIII, conversation; IX, poetry, chiefly old poetry which is new to the reader.

The scholar above all men must pass a test of his social efficiency.

It is true, as Chapman says, that Emerson's ideal scholar is a practical man. What a transformation would be brought about in our great educational institutions were the men who occupy the chairs such as he would have them be! He who has attained unto scholarship must needs have drawn deeply from the resources of society, and therefore is under the greater obligation to it. (3) "He is by constitution expensive, and needs to be rich." (4) He who has a secret that is valuable to society, or who has been equipped by the resources of society for service, is under binding, sacred obligation to be an instrument of society. The moment he ceases to recognize the force of and give heed to maxim "noblesse oblige," he at once becomes a parasite on the body social, sucking all from it and imparting nothing to it. (5) "He is immoral who is acting to any private end," while he only is moral who heeds the Kantian categorical imperative, to act on a

(1) Nat. Ads. and L., p. 154.
(2) Soc. and Sol., p. 161.
(3) Cond. of L., p. 85.
(4) Lects. and Bio. Sk., p. 43.
(5) Lects. and Bio. Sk., p. 94.

maxim fitly universal. (1) Any practical end pursued with selfish ambition proves a disappointment; we are born not as isolated individuals, free to seek individual prosperity only, but as integrant parts of the social organism. (2) "Man is born to be a reformer, a re-maker of what man has made; a renouncer of lies; a restorer of truth and good, imitating that great nature which embosoms us all, and which sleeps no moment on an old past, but every hour repairs herself, yielding us every morning a new day, and with every pulsation a new life." (3) Genius means nothing if it doesn't mean a greater capacity for labor, and it is only by labor that we may deservedly possess genius. (4) Indeed, it is only by the use of truth that we may become truly learned, for practice is essential to sound acquisition. The scholar must be the champion of all institutions and movements which look toward social betterment, toward the amelioration of human conditions, or else he is untrue to the trusts that are committed unto him. (5) The scholar who is a scholar and nothing more does not fulfill his highest function, because he is not a man complete. (6) Men should not allow themselves to center their energies on, and confine their activities to, some narrow little field until, as a mouse living in a tub, they begin to measure the world by their own little point of observation, and hence become entirely unfitted for wider usefulness. With a thousand tongues to preach Emerson's mighty gospel of scholarly breadth and the duty of social efficiency, the Emperor of Germany would scarcely have had occasion to lament the multiplication of highly educated men in the Fatherland. (7) But too often, alas, we see that nature has not balanced her gifts. Men so frequently lose in the breadth and symmetry of character as much as they gain in working power. (8) This loss of equilibrium of character, however, should not be attributed to excess of education; there really can be no such excess, provided the intellect be of the true kind that ends in action and not merely in a thought. The Oriental dreamer is as far on one extreme as the ultra-practical man is on the other. We only used the mount of inspiration and transfiguration that we may descend, equipped for service, into the valleys of human life and human experiences. (9) The scholar who is equipped with literary training only, is but poorly advantaged for the struggles of life. In order to stand the test of his value he is expected to answer such questions as these: "Who are you? What do you do? Can you obtain what you wish? Is there method in your consciousness? Can you see tendency in your life? Can you help any soul?" (Italicized by E.) (10) "Every man is a consumer, and ought to be a producer. He fails to make his place good in the world unless he not only pays his debt, but also adds something to the common

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(1) Nat. Ads. and L., p. 205.
(2) Nat. Ads. and L., p. 236.
(3) Nat. Ads. and L., p. 328.
(4) Nat. Ads. and L., p. 211.
(5) Lects. and Bio. Sk., p. 273.
(6) Cond. of L., p. 128.
(7) Cond. of L., p. 127.
(8) Nat. Ads. and L., p. 268.
(9) Lects. and Bio. Sk., p. 269.
(10) Cond. of L., p. 85.

wealth." There should be no mistake as to what is meant by service. (1) It is because of a superstition of sense, an optical illusion, so to say, that we think of the scholar as having no share in the world's activities because we do not see him engaged in the world's enterprises. It is a child stage of mind that can appreciate only those activities, the performance and effects of which are open to view. A higher reasoning reveals to us that thought alone is creating, (2) "for the hand can never execute anything higher than the character can inspire." (3) In discussing the man of letters Emerson tells us the story of how Napoleon, when operating in Egypt, on the approach of the Mameluke cavalry, ordered the grenadiers to the front, while the asses and the savans were ordered to fall into the hollow square. The ages have not sustained the verdict of such a valuation. From that very expedition Napoleon deserted, and his army was scattered. All that is left of the campaign came as a result of the patient toil and research of the despised savans. From their labors has come the great work of Devon, which paved the way for all the subsequent work done in that field by English and German scholars. (4) Again and again must be emphasized the disregard of the glint and glare of material fortune and the pomp and pageantry of glory that may accrue. Work is the thing of chief concern, not the reward of it. "The reward of a thing well done, is to have done it." (5) There is in America a peculiarly strong tendency for the intellectual classes to be drawn aside by the attractions of wealth, and as a result of this process, it is stated that all vigorous nations except our own have maintained a balance between the material and the mental life. Especially, Emerson thinks, are we lacking in imaginative powers, which he calls the "angel of earnest and believing ages," and to the powers of which the Hindoos, the Egyptians, the Greeks, the Arabians, and the Persians owe much of their civilization. (6) Our industrial skill has made our life more expensive and luxurious, more anxious and greedy. It has directed our minds downward rather than upward. (7) The thing of chief concern in the science of both England and America is theory rather than love and moral purpose. The collector's humanity has dried up like the plants he has gathered. He has been bottled up along with his lizards and snakes. As a reward for this sin the young minds that he would touch into a new life are repelled. The mightiest agencies which all those who profess to instruct have at their command, and without which there can be little success, namely, imitation and emulation, are lost.

The scholar has a peculiar kind of service, but it is service, nevertheless, and its value is great.

(1) Es. 1st Ser., p. 152.
(2) Es. 1st Ser., p. 341.
(3) Lects. and Bio. Sk., p. 242.
(4) Es. 1st Ser., p. 152.
(5) Lects. and Bio. Sk., p. 233.
(6) Lects. and Bio. Sk., p. 235.
(7) Cond. of L., p. 270.

(1) "Beauty, Good and Knowledge are three sisters—
That cannot be sundered without tears,
And he that shuts out Love, in turn shall be
Shut out from Love, and on her threshold lie,
Howling in outer darkness."

Social obligations must not be forgotten.

(2) All right education tends toward establishing man, (3) for which end the mere material wants of life are not adequate. The giver must go with his gift. (4) Social education, in fine, for which a moral basis is necessary, is the true education. Of this kind of an education we may say that the country will never have cause to complain of a surfeit. (5) The scholar, so far as the immediate accomplishment of results is concerned, who has not this power of social adjustment, both to the agreeable and the disagreeable members of society, is like a general, who, though skilled in the tactics of war, is unable to command the obedience of his army. The scholar should never consider himself exempt from the common duties of life. However deep a draught he may have taken from the Pierian Spring, it should not make him insensible to the cry of human need about him. And surely he of all men must be held to account for the social and political conditions of the state of which he forms an organic part. (6) Yet the peculiar office of the scholar is, of course, to deal in subtler things. He is to be a bringer of hope to the race. (7) He "is to be (as the poets were called in the Middle ages) Professors of the joyous science, detectors and delineators of occult symmetries and unpublished beauties; heralds of civility, nobility, learning and wisdom; affirmers of the one law, yet as those who should affirm it in music and dancing; expressors themselves of that firm and cheerful temper, infinitely removed from sadness, which reigns through the kingdoms of chemistry, vegetation, and animal life." * * * The scholar is here to fill others with love and courage by confirming their trust in the love and wisdom which are at the heart of all things; to affirm noble sentiments; to hear them wherever spoken, out of the deeps of ages, out of the obscurities of barbarous life, and to replenish them:—to untune nobody, but to draw all men after the truth, and keep men spiritual and sweet. Service, then, is a prime requisite of a true scholarship. (8) "I hope," says Emerson, "America will come to have its pride in being a nation of servants, and not of the served." His scholar is not, like Macbeth, to curse the times because they are out of joint, and lament because he was born in such a day, but with keenness of vision to comprehend the situation, he is to accept conditions as they are, with a view to improving them; and wherever he may be placed in life, with patience and steadiness of life and with devotion to the highest interests of humanity, he is to play the man in the struggle of the right

(1) Memoir—Tennyson, Vol. I., p. 119.
(2) Nat. Ads. and L., p. 63.
(3) Soc. and Sol., p. 112.
(4) Soc. and Sol., p. 30.
(5) Cond. of L., p. 263.
(6) Nat. Ads. and L., p. 185.
(7) Lects. and Bio. Sk., p. 250.
(8) Miscell., p. 422.

against the wrong, with nothing as a battle flag save the motto of old King John of Bohemia, "Ich Dien."

When we expect to find in Emerson a champion of one side or the other in the discussions on the technical educational questions, such, for example, as those relating to heredity, manual training, adolescence, and the like we may hope to do so only where such issues grow naturally out of his more fundamental, philosophical views. But in reading Emerson with an eye singled to such a character of subjects there is to be found an abundance of relevant material. And yet, as is characteristic of Emerson, such material will be found to be suggestive rather than argumentative. Emerson does discuss in many instances the phenomena of adolescence. (1) He quotes Plato as saying that: "A boy is the most vicious of all wild beasts," and the English poet Gascoigne as saying: "A boy is better unborn than untaught." He constantly evinces a knowledge in the budding powers of adolescent life, which like Napoleon's army at Eylan, if harnessed and directed, will lead to the accomplishment of noble ends, but, if left undirected or if misdirected, will lead to disaster. Emerson launches this great educational question, and among his words can be found many wise suggestions as to its solution. Emerson's oft repeated maxim, "Hitch your wagon to a star," is constantly applied by him in his discussions on the training of youthful minds and bodies. He emphasizes the fact that we are not to contravene, but to employ all legitimate youthful tendencies; an idea so much stressed in modern pedagogy, but which is hardly in danger of over-emphasis. Emerson expresses faith in the adequacy of education to solve this problem, saying in that regard: (2) " 'Tis inhuman to want faith in the powers of education." We have, too, from his hands quite an accurate picture of the youth. We are told (3) that books are to be used in the education of the boy only when he is ready for them, and that his readiness for them comes quite slowly frequently. The schoolboy receives the greater part of his education, not from his instructor, we are told, but from his playmates, or from the sights he sees along his road to school. He hates the long terms and strict discipline, but loves the freedom of the woods and the companions of his own choice; he hates his grammar, but loves his gun. In all of this the boy, Emerson thinks, is intrinsically right. "Archery, cricket, gun and fishing-rod, horse and boat, are all educators, liberalizers," says he, "and so are dancing, dress, and the street talk; and provided only the boy has resources, and is of a noble and ingenious strain these will not serve him less than the books." If a boy of noble mind finds that he has spent too much time in diversions and that while he is thus occupied some toiling companion of his

Emerson understood the nature of the adolescent and gives suggestions as to methods of training.

His nature.

Method of treatment.

What appeals to the adolescent is not always reckoned education.

(1) Cond. of L., p. 134.
(2) Cond. of L., p. 135.
(3) Cond. of L., p. 137.

has climbed another step in the pathway of knowledge, he begins to despise himself, and thenceforward things assume their proper proportion in his life. Emerson in this does not, it is evident, make provision for him who is not blessed with that noble quality of mind, leaving him to be dealt with according to the inexorable law of the survival of the fittest.

(1) "With the key of the secret he marches faster
From strength to strength, and for night brings day,
While classes or tribes too weak to master
The flowing conditions of life, give way."

(2) Sometimes a young man looks upon social functions, from the privileges of which he is barred, as being of much greater import than they are in reality. A ticket of admission serves him frequently as a means of disillusionment.

Adolescent's ideals have concrete form.

(3) In adolescent life our ideals are not abstractions, but are embodied in some concrete form in one or more intimate friends, from whom we are just far enough distant, intellectually or by reason of age, to effect the enchantment, and yet have not the power to judge them critically. After a while this office of the ideal, by the synthesis of other qualities that now become essential to the formation of our model character, becomes more and more difficult to fill, and thus gradually do the ideals of child life, that find their adequate expression in the concrete fade into more and more unapproachable abstractions.

This is a critical period.

Emerson tells us further (4) that soon after the age of puberty there occurs a crisis in the life of the individual, which, in spite of the fact that it occurs in a period of life by no means characterized by serious reflection, is usually a determining factor in one's career. In the case of woman the feelings of love are predominant. In men it is a time for decisions regarding education, occupation or location.

There is great mental strain.

There is, too, along with the (5) tumultuous passions of youth (6) an unusual mentality, due to warm blood, which, with its high pressure, induces a marked degree of critical activity resulting in a desire for great undertakings, which expresses itself often in voluminous reading, a thing well illustrated in Emerson's own boyhood, when he used to creep away into a cold upper room, wrap himself up in a woolen blanket and read Plato, causing in after years the thought of Plato to be associated with the smell of wool. Not least among the blessings of youth-time is the fact that nature's beauties come crowding into the mind with multiplied powers.

Nature's beauties have a strong appeal at this time.

7) "We remember," says Emerson, "when in early youth the earth spoke and the heavens glowed; when an evening, any evening, grim and wintry, sleet and snow, was enough for us; the houses were in the air.'

(1) Poems; Education.
(2) Cond. of L., p. 139.
(3) Nat. Ads. and L., p. 51.
(4) Soc. and Sol., p. 120.
(5) Lets. and Soc. Aims, p. 330.
(6) Soc. and Sol., p. 280.
(7) Soc. and Sol., p. 280.

Youth-time is the day of (1) poetry and (2) romance, but the poetry which comes with the strongest appeal is that which addresses itself to the eye and the ear. (3) The thoughts of the boy are wild, and yet are much freer from the bonds of custom than those of the adult. (4) He is distrustful of his own ability, and has not defined the extent of his usefulness or his place in the world, and hence we find him ready for innovations. (5) All are ready in youth to lay siege to the stronghold of conservatism, while in old age they entrench themselves behind it.

This is a time of diffidence.

The youth is radical.

Emerson remarks upon mental recapitulation as characterizing the steps of growth of the youth, upon which law, according to Spencer, M. Compte first gave to society the doctrine of the education of the individual along lines corresponding to the growth of the race. (6) "The boy," says Emerson, "is Greek; the youth romantic; the adult reflective," and further he adds: "The student interprets the age of chivalry by his own age of chivalry, and the days of maritime adventure and circumnavigation by quite parallel miniature experiences of his own. To the sacred history of the world he has the same key. When the voice of a prophet out of the deeps of antiquity merely echoes to him a sentiment of his infancy, a prayer of his youth, he then pierces to the truth through all the confusion of tradition and the caricature of institutions. (7) The youth is a moralist, and often to the point of puritanism.

The boy repeats the racial stages.

As to the question of how to deal with the adolescent in education, it may be said in the first place, that we above all else must appropriate the natural tendencies and powers found in him, rather than run counter to them or place our wills against them to bend them to our methods. Emerson says for himself that the regular academical and professional courses have not yielded him the good that he derived from an idle book under the bench in the Latin school. Books read in such wise usually answer the demands of an inherent appetite, and whether they be good or whether they be bad, there are in the end valuable results to accrue; for if they be good, some advantageous mental qualities will be fostered and stimulated, whereas if they be bad they may have a (8) cathartic effect upon the evil tendencies, which effect had far better come by means of books than by sad and disastrous experiences. Education should by no manner of means try "to thwart and balk this natural magnetism." (9) There are educative values in so many things which we usually do not recognize as being means of education, that Emerson is inclined to call our system a half-education.

The boy's impulses are not to be curbed, but directed.

Play should be employed as education.

(1) Es. 2nd Ser., p. 223.
(2) Es. 1st Ser., p. 242.
(3) Nat. Ads. and L., p. 238.
(4) Soc. and Sol., p. 307.
(5) Nat. Ads. and L., p. 248.
(6) Nat. Ads. and L., p. 109.
(7) Lects. and Bio. Sk., p. 179.
(8) Es. 1st Ser., p. 234.
(9) Lets. and Soc. Aims, p. 125.

Play is to be taken as chief among these. When we undertake to teach a youth subjects which he has nô desire for and which haven't for him any concrete value beyond serving as a means of satisfying those in authority over him, while at the same time we allow him to take no part in the games, and become a part of that most democratic of all institutions, a play ground full of boys, we are enemies to his highest interests and are unfitting him to fill his proper sphere of usefulness in after life. Emerson compliments the English custom of sending even the pampered child of luxury and wealth to the public school, where he may have some Spartan experience in roughing it with other boys. For the youth by all means, if not indeed for every adult, Emerson would say:

Contrast with others is a valuable schooling.

"Eine Blick ins Buch hinein und zwei ins Leben
Das muss die rechte Form dem Geiste geben."

To accomplish the most worthy results in the training of adolescent life we must approach the child on common ground by a sympathetic understanding. We may, to be sure, ignore his likes and dislikes and force obedience from him by superior strength, but in that case we defeat ourselves because, though we may overwhelm the strength of body, we cannot stop the action of a revolting soul. There is nothing, Emerson thinks, that is more repressing, more cramping upon the spirit of a child, than a hard formalist. Even the understanding is paralyzed by a tyrant of this kind. If there be one thing for which the soul of youth longs more than another it is freedom, and like an eagle in a cage, he will beat out the better part of his life against any bonds of bodily or mental imprisonment. As Spencer says is the case with mankind, the young boy never likes to do things in the same set way that is employed by everyone. His employment from day to day is a continuous round of explorations. How to harness this mighty Niagara of almost wasted power remains as yet one of the unsolved problems in education.

The boy needs sympathy.

Freedom of action is essential.

(1) "To the young mind," Emerson says, "every thing is individual, stands by itself. By and by it finds how to join two things and see in them one nature; then three, then three thousand; and so, tyrannized over by its own unifying instinct, it goes on tying things together, diminishing anomalies, discovering roots running under ground whereby contrary and remote things cohere and flower out from one stem."

The young see things as individuals.

(1) Nat. Ads. and L., p. 87.

(1) . The child mind, too, is able to appreciate only the external world The belief that it is only an appearance comes later, but with culture it comes as inevitably as did the first impression. (2) The child is full of tendencies to react. Its instincts and impulses are more numerous and more varied than those of lower animals, but in proportion to the superiority of its powers of discrimination the sooner are these covered up by education. The training of the child mind, therefore, begins as soon as it is able to react to environment, and reap the consequences of its actions, and (3) hence its culture cannot begin too soon. Early youth is the best time to gain the most from imaginative literature, and if that be wasted on rude companions, the open sesame of literature is lost, as well as a fruitful source of much of the pleasure of life. Educational influences are not confined to the work of the instructor. The right kind of home atmosphere seems almost essential to any high degree of intellectual attainment. (4) "To the well born child all the virtues are natural, and not painfully acquired," says Emerson.

They appreciate the external world.

The child's training begins early.

Good home atmosphere necessary.

One thing to be early taught the boy is that knowledge is something to be acquired by successive steps of labor. (5) He is in the stage of dreaming of a fountain of youth, of magical powers and such like. He has the idea that there is a teacher who can sell him wisdom, having not yet learned that man is endogenous and that his education is an unfolding.

Second in importance to reaching truth directly from nature, life, and the mind world as a means of education, Emerson would place the "reading of men's transcripts of it" in the forms of books which we as "heirs of all the ages," have come into possession of. It is a fact, to which emphasis has already been given, that Emerson fully recognized that ripeness of culture could not come from the necessarily limited amounts of subject matter covered in a college course. (6) Indeed, Emerson considers that college education itself consists merely in reading certain books which by common consent are regarded as the best conclusions that have been reached on whatever specific lines the students desire to labor. In reference to the superstructure of after-reading which is based upon the foundation laid in college, Emerson affords many suggestions. (7) To those who are bewildered by the countless thousands of volumes that are extant and that are asking to be read, he offers a comforting thought. He says that when he visited the Cambridge library he generally had the feeling that after all he had the best of it at home, within the four walls of his own study. (8) Since the mind and

Reading is to be reckoned one of our chief means of education.

"Non multa sed multum."

(1) Nat. Ads. and L., p. 63.
(2) Miscell., p. 149, Cf. James' Talks to Teachers, p. 38.
(3) Cond. of L., p. 157.
(4) Es. 1st Ser., p. 259.
(5) Rep. Men, p. 13.
(6) Soc. and Sol., p. 183.
(7) Soc. and Sol., p. 185.
(8) Soc. and Sol., p. 185.

heart of some of the world's most advanced ages have been fed upon single writings, as has been the case with the Bible for large portions of Europe, Hafiz for the Persians, Confucius for the Chinese, Cervantes for the Spaniards, Emerson thinks that the non multa sed multum maxim is a good one to heed. He suggests that the human race might be the gainer were all in English literature destroyed but Shakespeare, Milton and Bacon. Yet if the student have a strong native aim and "follow that as his guide in reading he will read to advantage whether he read much or little." Reading along the line of natural bent is like striking with a hammer when we have the force of gravity as an ally. This accounts for the difference between what a boy gets out of a book which he must read on the sly and one which he is compelled to read. But it is well to economize time by reading only those books which have passed through the winnowing process of time, and to shun the gossipy products of the press, to avoid reading what you are able to absorb plenty of by listening in good company. Emerson offers three rules as a reading guide. They are: I, Never read any book that is not a year old; II, never read any but famed books; III, never read any but what you like.

See first if the book has any real value before reading it.

As a test of a good book Emerson would say, (1) that if, when you have read a book, you shut it up a richer man, then you have read a good one. (2) There are books that are so close to the world of actuality that they act the part by us of parents, lovers, and deep experiences. (3) Even the best books, however, we are to remember as being merely records of things and not things themselves. (4) The best book, therefore, is the one that is calculated to provoke mental activity on the part of the reader. (5)

Poetry should have a large place in our reading.

Plato is quoted as saying that the best in all literature can be found in "the affirming, prophesying, spermatic words of man-making poets." As a matter of fact, Emerson thinks that, since we are so often content with science as an end, Plato is right in saying that "poetry comes nearer to vital truth than history." (6) To consider science as aught else than a means of getting at truth is to tear it from its proper place. Hence the student (7)

Read actively, not passively.

should read actively, not passively; he should transcend the bounds of the writer's thought, using what he has read as a basis for his own conclusions. As a painter must transform himself into his subject, so a reader must enter into the spirit of literature.

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(1) Soc. and Sol., p. 187.
(2) Soc. and Sol., p. 182.
(3) Soc. and Sol., p. 181.
(4) Soc. and Sol., p. 279.
(5) Soc. and Sol., p. 278.
(6) Nat. Ads. and L., p. 73.
(7) Es. 1st Ser., p. 13.

Conversation to Emerson was vastly more than mere passing away the time, or the indulgence in purposeless gossip. He treats it as another example of the possible application of the natural tendencies and the resources of human nature as a means of education. Like music, pictures, dancing, theatre, sculpture, traveling, war, mobs, fire, gaming, politics, love, science, it serves the intellect as a stimulus, a wine, or narcotic. In discussing conversation as one means of inspiration, Emerson says (1) that when it is best it is a series of intoxications, that it is a better metaphysical professor than Aristotle, Kant or Hegel, a true school of philosophy, and a college where we may learn the nature, the true value and the result of thought. In moments of animated conversation we often have, says Emerson, (2) "glimpses of the universe, hints of power native to the soul, far-darting lights and shadows of the Andes landscape, such as we can hardly attain in lone meditation. Here are oracles sometimes profusely given, to which the memory goes back in barren hours."

Conversation is a means of education.

(3) The picturesque language which comes in those lucid intervals is a guarantee that the person has been in touch with truth and God. This kind of language pierces through the shell of hackneyed speech and begins to glow with an original fire. In earnest conversation material images rise in the mind with every thought, for it is the blending of experience with the present action of the mind, and indeed is really creation. (4) Despite the fact that conversation is a common art, is one in which the whole of mankind is daily engaged, it nevertheless is one which will remain potent in the coloring of our mental life. Contact with the wise can be counted as our most valuable experiences.

State education.

Society is an organism and therefore it is right to tax the rich for the benefit of the poor.

(5) Emerson recognized the old and yet increasingly popular notion of the organic conception of society. Whatever ills are suffered by any portion of humanity entail an amount of suffering upon the body social. The interests of the rich become common with the interests of the poor, and the interests of the learned are one with the interests of the illiterate. The theory of taxation for the purpose of education is therefore just.

(6) It is to the eternal praise of New England that it, first perhaps of any country on earth, has made such an expenditure for education. Not only do we in America think it obligatory upon our commonwealths to furnish rudimentary education to the masses; we think they should have access to higher lines of languages and sciences, as well as the professions.

(1) Lets. and Soc. Aims, p. 276.
(2) Cond. of L., p. 256.
(3) Nat. Ads. and L., p. 36.
(4) Cond. of L., p. 256.
(5) Miscell., pp. 173, 279.
(6) Lects. and Bio. Sk., p. 125.

New England has done much for free education.

(1) There has never been a country "which has made such provisions for popular education, where intellectual entertainment is so within the reach of youthful ambition." The poor man's son is educated. (2) The very cry of the people for such education shows that the state has something else to do besides acting the "banker and the executioner."

The highest duty of the State is to educate in citizenship.

(3) The highest achievement of a commonwealth is to give its members thorough education. It is therefore within the realm of its duties to give the poor man the means of enlightenment. There are means of culture which all need and yet few can afford them. Shall the masterpieces of art and sculpture, the refining influences of music and literature, be enjoyed only by those who have the means of procuring them? We do not have in America the feudal forms of inheritance whereby such things may be gathered into certain families and handed down to posterity intact, but by our democratic division of estates into small portions we are left for the most part to depend upon the state to provide these means of education and inspiration. (4) The middle class is always the source of letters and science. As the chief beneficiary of public education it does not fail, consequently, to give in return that which will redound to the general good. (5) The greatest civic problem is how to give everyone access to the treasures of our social heritage. Emerson emphasizes again and again that the state and the very world itself are for the good of the individual, and in so far as they are conducive to the highest good of these are they performing their function.

The State can do much that the individual can not.

It is asserted that only fools must learn by experience; the wise take advantage of the experience of others. (6) For developing manliness and heroism there seems to be nothing so well suited as successive trials and failures. He who knows how to turn defeat into victory is doubly equipped. (7) "I wish the youth," says Emerson, "to be an armed and complete man; no helpless angel to be slapped in the face, but a man dipped in the Styx of human experience, and made invulnerable so,—self-helping." (8) "The angels which weave laurels of life for youthful brows are Toil, Want, Truth, and Mutual Faith." (9) Hardships, however, are not ends in themselves, but derive their virtue from being a means to an end. "Pounding beans," says Emerson, "is good to the end of pounding empires one of these days; but if, at the end of years, it is still only beans!" (10) Again, it is to be said, hardships endured for worthy ends are educative, but hard-

Experience is also a necessary part of man's education.

(1) Soc. and Sol., p. 116.
(2) Nat. Ads. and L., p. 359.
(3) Nat. Ads. and L., p. 362.
(4) Eng. Traits, p. 286.
(5) Cond. of L., p. 96.
(6) Lects. and Bio. Sk., p. 60.
(7) Lects. and Bio. Sk., p. 240.
(8) Soc. and Sol., p. 117.
(9) Lects. and Bio. Sk., p. 448.
(10) Nat. Ads. and L., p. 234.

ships endured to-day that we may have luxury to-morrow are not. (1) Our institutions of state are veritable schools of experience. The towns, meetings and the like carry with them that rapid means of education, responsibility. Through the influence of such things we in America have grown to be noted for invention, free thought, and desire for novelty, even to the extent of follies. (2) The emergencies that were incident to our early western life, the Indians, horse-thieves, rowdies, and the loneliness brought out many heroic qualities that were latent in men, so that among those who have lived in such surroundings we have many strong charactered men. (3) The hardships of navigation have frequently developed a national type of character. Our most advanced nations have grown up under conditions that subjected them to difficulties and hardships. (4) Speaking of Oxford students, Emerson said that the diet and the rough exercise they got there had a tendency to call out some of their Norse power. (5) Wealth, luxury and ease belong to and content the weakling and also have a tendency toward making weaklings. The wealth of the heroic fathers may corrupt the sons and the grandsons into failures.

A scientist should not lose sight of the deeper significance of things.

After a study of Emerson's attitude toward science, one cannot help thinking that such a man as John Muir would fulfill his ideal as a scientist. John Muir is an original investigator and a profound thinker. But above all, his life has not dried up with the pine cones he has preserved and classified. There is a warmth and depth of soul life that lends a glow of inspiration to every word he utters. With the keenness of scientific insight, he can ferret out the laws of the formation of mountains and hills; still they have tidings for him that are beyond the ken of the senses. The flowers and the trees he knows, but the sunshine of their peace, which cannot be pinned in lifeless form to the pages of a scrap book, this he prizes most. The birds sing to him in tender madrigals, and even the creeping snakes are his brothers. The winds tell him of their freshness and the storm of their strength. To those who visit him in his California home he says that he is a sojourner there, and pointing to the distant mountains says: "Yonder is my home." This kind of a man Emerson thinks a scientist can be and must be or else his labors will prove but useless dregs of disappointment. Man cannot live upon the dry husks of classified facts alone. (6) It is better to be ignorant of details than to miss the things that are of vital import. (7) "All the facts in natural history," says Emerson, "taken by themselves, have no value, but are barren, like a single sex. But marry it to human history, and it is full of life." (8) The laws of nature all have their counterpart in mind. (9) All things are arranged in pairs so fitted and adjusted each to

(1) Miscell., p. 410.
(2) Miscell., p. 416
(3) Soc. and Sol., p. 25.
(4) Eng. Traits, p. 202.
(5) Lets. and Bio. Sk., p. 60 and Lets. and Soc. Aims, p. 99.
(6) Nat. Ads. and L., p. 71.
(7) Nat. Ads. and L., p. 33.
(8) Lets. and Soc. Aims, pp. 211 and 257.
(9) Soc. and Sol., p. 217.

each that they cannot be sundered without the loss of the greater part of their value. (1) If the tones of a distant church bell bring to our minds nothing but a conception of vibrations in the air; if the old church, around which the memories of childhood linger, represents only a rough pile of masonry; if the ocean is only so many gallons of salt water, and its beach so many grains of sand; we are to Emerson the victims of mental atrophy. The fact is that "brute matter is part of something not brute," and not only has its origin in the supersensual, but is constantly tending toward a moral end. (2) Things are but shadows of the infinite. (3) "The noblest ministry of nature is to stand as the apparition of God. It is the organ through which the universal spirit speaks to the individual, and strives to lead back the individual to it." (4) The world and the body of man proceed from the same source. They differ in that one is a more remote incarnation and also in the fact that the body is swayed by the powers of will, while the world remains fixed in its laws, being thus an expositor to us of the divine mind. (5) The discovery of the occult relations of things constitutes the chief delight in the contemplation of the facts of nature. (6) The presence of this higher spiritual quality is essential to the beauty of nature. (7) The constant insight into the meaning of things was the secret of Thoreau's power. Too often men are pursuing unrealities and phantoms and missing the whole significance of life. (8) "The voice of divination resounds everywhere and runs to waste unheard, unregarded, as the mountains echo with the bleating of cattle."

A moral basis of character is the only true foundation for an education.

The individual who has a trained intellect, but is bereft of a moral basis of character, has, to Emerson's mind, thwarted the final and only purpose of his education. (9) And not only is this true, but those who are morally blind are to an extent intellectually blind. "The foundation of culture, as of character," he says, "is at last the moral sentiment." Some of the world's great thinkers have had the conviction that piety is an essential condition of true science, that great thoughts can only come from great hearts. (10) Man is constantly in a state of culture, which state tends ever toward a complete flowering in morality. Emerson would sanction the assertion of Victor Cousin, that (11) "A religious and moral education is the first great want of a people," an idea emphasized also by Herbart, and for the attainment of which he offered a method. The recognition of social obligations marks man as man. (12) Without morality there can be no such thing as social education. (13) The universe itself is subject to

(1) Soc. and Sol., p. 285.
(2) Es. 1st Ser., p. 289.
(3) Nat. Ads. and L., p. 66.
(4) Nat. Ads. and L., p. 68.
(5) Nat. Ads. and L., p. 16.
(6) Nat. Ads. and L., p. 25.
(7) Lects. and Bio. Sk., p. 432.
(8) Lects. and Bio. Sk., p. 32.
(9) Lets. and Soc. Aims, p. 216ff.
(10) Cond. of L., p. 196.
(11) "Mind," Jan., 1904.
(12) Soc. and Sol., p. 30.
(13) Es. 1st Ser., p. 104.

There is such a thing as a moral order of the universe.

moral order. The injured orphan's cry does not go unheard, nor does the injurer's sin fail to meet its Nemesis. (1) If you place a chain about the neck of some helpless slave, somehow the other end winds about your own. The history of persecutions shows them to be but disturbances in the moral equilibrium, which must sooner or later adjust themselves. On the other hand, he who labors in harmony with these subtle forces will find them slow, but almighty allies. (2) In being true to the higher voice within him man is not alone, for the universe itself stands upon his side. (3) The moral element puts one at the very heart of humanity, and also of nature, for it is true that (4) "every material organization exists to a moral end, which makes the reason of its existence." (5) Moral laws must ever have great influence in this race of ours, being, as we are, a race of individuals, and, too, of high intellectual organization. (6) Far better, therefore, for us than any other renaissance would be a revival of our sense of duty, of the obligations resting upon us to hallow the powers of intellect to the service of humanity.

An education that does not recognize the value and possibilities of man is a failure.

As science must go out with the assumption that all the facts within reach are capable of correlation and reduction to system, so education must assume the infinitude of man as related to his environment. Modern science through the influence, no doubt, of Darwin, has been long forcing the student minds to interpret man altogether in the light of his remote origin, so that they are frequently like an observer looking at two objects before his eyes, one immediately in front of the other, who has his vision focused on the remoter object to the sacrifice of clearness in the nearer. Our vision too frequently sweeps by man as he is now, leaving him in dim, shadowy outline, and centers its interests and attention upon his far-away origin, where low instincts and animal nature hold sway. Instead of looking through the filth of dirt upward to the rose that is blooming above it, the point of view has been too largely through the rose downward toward the soil from which it has come. The student cannot consent to follow the man who ignores the genetic point of view, yet he should not be asked to follow him who has that only. (7) To Emerson man is the fruitage of all foregoing ages, the very flowering of civilization. Some mighty pioneer force has been

(8) "Patient through heaven's enormous year
To build in matter home for mind."

(9) "Nature has dearly at heart the formation of the speculative man or scholar. It is an end never lost sight of, and is prepared in the original casting of things. He is no permissive or accidental appearance, but an

(1) Es. 1st Ser., p. 108.
(2) Cond. of L., p. 185.
(3) Lects. and Bio. Sk., p. 94.
(4) Miscell., p. 328.
(5) Miscell., p. 412.
(6) Lects. and Bio. Sk., p. 211.
(7) Miscell., p. 419.
(8) Poems.
(9) Rep. Men, p. 252.

organic agent, one of the estates of the realm, provided and prepared from of old and from everlasting, in the knitting and contexture of things." (1) Nature has no meaning other than that its final end is man. (2) Nothing is of absorbing interest save man. The very charm in the perfection of nature's laws is based upon their relation to him. Emerson saw in nature what John Fiske beautifully terms "The dramatic purpose of things," having no sympathy with the view of the world as a "fortuitous concourse of atoms," or a Lucretian intermixture of primordial elements.

Emerson emphatically rejects the idea of original sin in man and (3) insists upon the sacredness of the law of self. (4) Man should realize his worth and dignity. "Let him not peep or steal, or skulk up and down with the air of a charity-boy, a bastard, or an interloper in the world which exists for him." (5) He should respect the emphasis which his heart of hearts places upon things, for that emphasis is always right. (6) It must not be forgotten that Emerson saw the weaknesses as well as the strength of mankind, but while he was looking upon man as a weed by the wall, he did not lose sight of the fact that he was as well a very "God in nature." To give due emphasis to all the aspects of man's nature constitutes one of the vital problems of education. It is safe, however, in a materialistic age like the present, to insist upon the Emersonian point of view of man, in spite of the cry of those who are ready to say that it is more poetical than scientific. Carlyle says: "To the eye of vulgar logic, what is man? An omniverous biped that wears breeches. To the eye of pure reason, what is he? A soul, a spirit, and divine apparition. 'Round this mysterious me, there lies, under all those wool-rags, a garment of flesh (or of soul) contextured in the loom of heaven." Such is Emerson's view in epitome of man's inherent worth.

As a final word and also as a recapitulation of some salient points in Emersonian education, it would be well to reserve his essay under that particular head, a brief synopsis of which will be offered.

Analysis of essay on education.

(7) In the beginning of this essay Emerson asserts that "intellectual power seems cheap at any price," and again, that man's field of knowledge is the whole realm of nature. In this we see at once the value he sets upon education and at the same time the resources he thinks to be at our disposal.

A mighty step in social progress has been made when the law permits the poor man to say to the rich, "You must educate my son, and educate him well." More wonderful than the story of Aladdin's lamp is the opening of the doors of sense that shut in the human soul. The power of transmitting the heritage of enlightenment is peculiar to the human race. Man has done well to designate wealth by the word means, indicating by that, that it is not an end in itself. So nature should be regarded. The instant we look upon

(1) Cond. of L., p. 55.
(2) Cond. of L., p. 27.
(3) Es. 1st Ser., p. 137.
(4) Es. 1st Ser., p. 62.
(5) Es. 1st Ser., p. 137.
(6) Es. 1st Ser., p. 286.
(7) Lects. and Bio. Sk., p. 125.

it as an end it becomes at once a pernicious guide, and we its slaves. The wants of the body and the corresponding means of supplying them, to be found in nature, have served to teach man many of his useful arts. The love of power is an inspiration toward activity and toil, it sharpens his power of perception and fills his memory with facts. There is nothing so potent as nature, however, to call out the latent forces of the mind. Every object, like an Aeolian harp in the wind, draws music from the soul. The landscapes, our friends, our deeds, and the pains we suffer, leave us different individuals. The varied experiences through which we pass serve to unlock the hidden faculties of the mind. Whether or not we reach the object of our endeavors, the educative influence is secured, and another unused chamber of the soul is opened.

The discovery of analogous laws running through nature affords to man a pleasing sense of extended power. Minds are made intelligible to each other by this permanence of nature. Man's intellectual task will have been completed when he has taken up into his mind the universe. Thus his curriculum is infinite and it is the duty of a just education to acquaint him with the infinitude also of his consciousness.

Let the student not fail to learn the symbolical character of life, and above all, let him not surrender his freedom at the shrine of dogmatic authority. There is vast room for educational reform. Instead of our education being as comprehensive as the breadth of man's nature demands, it is narrowed to the point of forcing each man to conform to some unchanging standard. Emerson would heartily deplore the appeal so often addressed to college men to develop a "type" among themselves, a peculiar dress, walk, carriage of the head, or something of that kind, so that each student, instead of being what above all else he should be, namely, himself, must be like Shakespeare's observer of the clouds, who would see whatever he was told to see. Emerson thinks there is already too much conformity in our education and far too little of respect for inherent capacities that are peculiar to every individual. Those who have addressed themselves to the problem of negro education have strangely failed to recognize this fundamental principle, and are undertaking to feed the mind of that race upon the same thing that is prescribed for the whites, the former having scarcely passed through the babyhood stage in racial development, the latter having ages of civilization behind it.

The child let loose in the street follows some natural bent of mind, and hence we need not wonder at the mass of facts he gathers from these sources. We are too much given to looking upon the child mind as essentially wrong and needing to be changed in its tendencies. As a matter of fact, it is right and needs freedom of action. The boy should be given free access to every kind of literature, so that in it all he may find something that will appeal to his nature. Imaginative literature, Emerson thinks, will be found most likely to do this. Above all, he thinks good epic, tragic and lyric poetry should be given him. The secret of success in it all lies in respecting

the individuality of the pupil. Preserve your own integrity, make no compromises with his mistakes and his wrongs, but maintain the integrity of his nature. Oftentimes the following up of what seems to be an unpromising impulse will lead to great results. We must come back to natural methods in education, which may be typified by the case of the boy who, with eager delight, learns from a comrade some boyish sport, while the comrade is equally delighted to impart the instruction, or a Mark Hopkins, if you please, seated on one end of a log and an eager student on the other.

All sorts of students flock to our colleges; in order to accommodate all a common level must be struck and the striking of this common level is often a death blow to genius. We strive to reduce the students to a class that can be dealt with by some sort of educational machine, that will turn out wholesale quantities. The tedious method of moral suasion has been replaced by a method of punishment that has been found effective with the average student. The child should be encouraged in self-expression by every possible means. Not much is needed to be said to him, but much should be done for him to see. Put a high price upon his researches in fields that appeal to him.

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INVESTIGATIONS

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THE HOME FIELD IN THE STUDY OF GEOGRAPHY.

By R. D. GEORGE, A. M.
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"In all its effects, learning the meaning of **things**, is better than learning the meaning of **words**. Whether for intellectual, moral or religious training, the study of surrounding phenomena is immensely superior to the study of grammars and lexicons." (Herbert Spencer).

The following suggestions are intended, not to create a distaste for the proper study of grammars and lexicons, but to stimulate the desire to learn the meaning of **things**. In the teaching of Geography, the home field should be used to the fullest extent possible. The rill is a river in miniature. It obeys the same laws, does the same kind of work, and may teach the same lessons. If we understand the hills and the lessons they teach, we have a good introduction to the secrets of the mountains. The pond or the reservoir may show us many of the phenomena of the sea. The plant and animal geography of our own county and state is influenced by, and conditioned upon the same forces which operate the world over.

The local field conditions for the study of geography in Colorado are particularly favorable, and while there may be no single locality in which the opportunities are suitable for all the lines of work mentioned in this paper, there is probably no High School in the state, so situated that it is impossible to do good field work.

The study of the weather—meteorology: This includes the temperature, moisture, pressure and movements of the atmosphere; storms and other phenomena of the air. Much good work can be done with only such instruments as are found in the science laboratories, and such as may be constructed without difficulty, for the purpose. But with a small outlay for instruments and books, results of greater scientific value can be secured. The best guide for work in the study of the weather is, Ward's Practical Exercises in Meteorology, published by Ginn and Company, at $1.15. (At the end of this paper will be found a list of books and instruments useful in a fuller study of the subject.) Some of the work which may be done with few or no instruments would be the keeping of records of rain and snow fall, Temperature, the direction, and approximately the rate of the wind, the quarter from which storms come. Rainfall records can be kept in an ordinary diary, or on a callendar. The letters "r" and "s" may stand for rain and snow, and any simple device may be adopted to show whether the storm was between 12 o'clock midnight and 12 o'clock noon, or between noon and midnight. The letter placed in front of a vertical line, thus r|, might be used to indicate rain before noon, and the letter placed after the vertical line to denote rain or snow after noon. A still more detailed record could be kept by putting with the letter, the figure denoting the hour, thus, |s8 would mean snow at eight o'clock in the evening. For satisfactory results in measuring

the quantity of rainfall, the rain gauge should be used, but an approximate estimate can be made by choosing a suitably exposed place and arranging a receiver for a vertical-walled vessel of sufficient depth to prevent the water splashing out. After the storm the depth of the water in the vessel will represent the rain fall. If the area of the top of the vessel in square centimeters is known, more accurate results can be secured by pouring the water into a tube graduated in cubic centimeters.

The directions from which storms come srould be recorded, and it would soon be apparent to what particular winds we are chiefly indebted for our rainfall.

Very satisfactory temperature records can be kept with a very inexpensive thermometer. The readings should be made at the same hour or hours daily. An easily constructed weather vane will serve as a means of indicating the direction of the wind. Below the vane, but on the same support, a cross can be arranged to mark the cardinal points of the compass, and to facilitate the reading of the vane. The apparatus should be at a sufficient height to be unaffected by the presence of houses and other buildings. Dryer's Lessons in Physical Geography, p. 404, gives the following scale for estimating the rate of the wind:

"1. Light, 2 to 5 miles per hour, moving leaves.
2. Moderate, 7 to 10 miles, moving branches.
3. Brisk, 18 to 20 miles, swaying branches, blowing up dust.
4. High, 27 to 30 miles, swaying trees, blowing up twigs.
5. Gale, 45 to 50 miles, breaking branches, loosening bricks, signs etc.
6. Hurricane, 75 miles, destroying everything."

By the aid of the "Illustrated Cloud Forms," published by the U. S. Hydrographic Office, Washington, ($1.00), simple cloud records can be made without difficulty.

The history of water: The water which falls to the earth's surface as rain and snow is disposed of in three principal ways:

1. A part enters the ground, becoming ground water. Of this ground water, a part issues again as springs and finds its way to the rivers and thence to the sea.

2. A second part form pools, rills, streams and reaches the drainage lines without passing beneath the surface of the earth. This is called the "runoff."

3. A part is evaporated back to the atmosphere before it enters the ground or joins the runoff, but still more passes back to the atmosphere by evaporation from the surface layers of rock and soil which had absorbed it as ground water. Observe how this division of the water into these parts is affected by:

1. The shape of the surface on which it falls.
   (a) Loose sand, soil, clay.
2. The kind of material upon which it falls.
   (b) Broken or jointed rock.
   (c) Unbroken bare rock of different kinds.
3. The rate at which the rain falls, and the duration of the storm.
4. The dryness of the surface upon which it falls.
5. The season, temperature, wind, etc.

Evaporation: The study of the conditions affecting evaporation furnishes very interesting work, and can be carried on without any apparatus, though a thermometer and a hygrometer would be very useful. Observe the rate of evaporation as affected by:

1. The temperature of the air and of the surface from which evaporation is taking place.
2. The movement and temperature of the wind.
3. The moisture contained in the air (humidity).
4. The slope of the surface and the exposure to the sun.
5. The area exposed to evaporation.

Experiments may be made on various kinds of materials:

A. Put a measured gallon of pure water into a shallow vessel, and the same quantity into another vessel having one-half or one-third the surface area. Record the temperature of the water and the weight of the filled vessels, and expose them in the same place. After a number of hours or a couple of days, weigh the vessels and compare the loss by evaporation. If it is not convenient to conduct the experiment by weighing, the loss may be seen by measuring the water remaining, but this will necessitate pouring it out of the vessel used.

B. Take two vessels of the same form and capacity, and of the same material, and put into each a weighed, or measured quantity of water, say 10 pounds or one gallon, and see that the temperature are the same. Add half-a-pound of common salt to one of the vessels, and stir it gently until the salt is dissolved. Expose them in a place favorable for evaporation and compare the loss of weight after a given number of hours. The effect of other salts, and of greater proportions of common salt may be tested.

C. Take equal volumes of fine sand, coarse sand, sand and clay mixed, and pure clay; dry them and place them in vessels of the same kind and form so that the materials are the same depth in all. Add to each a weighed or measured quantity of water and see that the water is uniformly distributed through the masses. Record the weight of each, and expose them in the same way, and compare the loss by evaporation after a certain time, and compare the depth of surface drying in the different materials.

D. Make the same tests, but cover the vessels with thin white cloth, and again with thin black cloth. In each case expose them to direct sunshine.

E. Take two vessels of the same kind and form and place in each the same quantity of fine sand moistoned with the same amount of water. Cover one with black cloth and the other with white. Weigh them and place them in the sun, and after a given time compare the loss of weight by evaporation.

F. Repeat any or all of these experiments under different weather conditions; for example, on a hot day and on a cool day; in a strong

wind and protected from the wind; when the air is very dry and when it is filled with moisture.

G. Experiment C may be varied by having two sets of vessels, and leaving the materials very loose in one set, and compacting them in the other.

Stream Study. This should include the exploration, and if possible, the mapping of the basin of the stream, measurements and records of its flow from season to season, the character of its waters and the work they are doing. A drainage basin generally includes:

1. A permanent stream with permanent branches.
2. Intermittent streams.
3. Storm washes, gullies and ravines, which have streams only during and a short time after storms.

In a study of the drainage courses and the boundaries of the basin, answers should be sought for the following questions:

1. What conditions are necessary to information of a permanent stream?
2. Why are some of the streams of this basin intermittent?
3. What conditions have influenced the location and direction of the various tributaries of this basin?
4. Is the size of the drainage basin fixed, increasing or decreasing?

What are the causes of changes of area or drainage basins?

The stream basin includes all that area from which the waters would find natural drainage toward the stream. If the study of a river is too great an undertaking, a tributary can be chosen. Each branch watercourse should be traced headward to the divide which limits its drainage area, and if a reasonably good land office map can be found, showing section lines and other details, the position of the divide can be traced upon it. The direction of stormwater channels and washes can be added; the position of rapids and falls; terraces, bars and islands indicated. The shape of the channel can be shown, and the nature of the material in which it is formed, may be indicated throughout its course.

In measuring the flow of a stream, choose a place where its course is straight for 50 or 100 feet, and where the banks and bottom are regular and the width is uniform. Set up two stakes 100 feet apart and as close as convenient to the water's edge. Toss a chip into the water a few yards above the upper stake and note exactly the second at which it passes each stake. The difference between the times at the two stakes will be the number of seconds required for the water to flow 100 feet. A number of tests should be made so as to find the rate in the middle and at points between the middle and the banks. If the tests are well distributed across the stream, the average of the results will be about the rate of the surface flow of the stream. Suppose that five tests give the followning results in seconds: 9, 12, 11, 8 and 12. The average surface flow would be the sum of these divided by 5, that is 10 seconds for 100 feet, or 10 feet per second. As the rate at the bottom is less than the surface rate, it is usual to assume that the rate is nine-tenths its surface rate, which gives us 9 feet per second.

Various methods may be used to find the average depth. If the stream

can be waded, it may be measured with a pole, at regular intervals from bank to bank. If it is too deep for this method, a sounding line can be fastened to the end of a pole. The sinker should be heavy enough to carry the line to the bottom in spite of the curent. There should be markers on the line, at intervals of three or four inches, to aid the eye in fixing the point to which the line sinks in the water. If tests are made at regular intervals from bank to bank, the average of the results will be the average depth of the stream.

The width can be measured by a cord or a tape line. If necessary, a cord can be got across by tying a pebble to it and throwing the pebble to someone on the opposite bank. It is customary to allow a small amount for the eddying and back-flow close to the banks, but sometimes this is not necessary.

Having the rate per second in feet, the average depth in feet and the width in feet, the flow in cubic feet per second will be the product of the three numbers.

The energy of a stream is spent in doing various kinds of work. Some of the more apparent parts of this work are: the widening, deepening and lengthening of the valley; the removal of the materials loosened in this process; the building of bars, terraces, islands and deltas. Suitable sections of the valley may be chosen and mapped in detail. Cross sections and longitudinal sections of the valley and channel should be drawn to scale if possible. The positions of bars, islands, teraces and deltas should be indicated, and the distribution of mud, sand, gravel and boulder areas could be shown by means of different colors. The pebbles and boulders of the valley show the kinds of rock on which the stream is working, and their size, outline and surface tell something of the length of their journey. A more detailed study of the materials of the valley can be made by collecting pebbles and chips from the boulders and comparing and arranging them according to varieties, and if possible tracing each variety to its scource higher up the stream. In this work, a more or less detailed geological map of the valley can be made.

The waters may be examined for suspended solid matter and for matter in solution. The amount of matter carried in the solid form may be estimated in various ways. A measured quantity of the water may be evaporated and the solid matter left in the vessel may be weighed. Or, a carefully measured gallon or two of the water can be weighed accurately, and its weight compared with that of the same measure of clear water. The difference between the weights will be the weight of the suspended matter less the weight of the water displaced by it. If we call the specific gravity of clear water 4.0, the specific gravity of the solid matter carried by the stream would be about 2.5, and so 2.5 pounds of solid matter would weigh only 1.5 pounds in water. And in order to find the weight of the solid matter in the water, we must multiply the difference between the weight of the stream water and that of the clear water by $\frac{2.5}{1.5}$, or $\frac{5}{3}$. Thus, if the difference between the two weights were 3 pounds, the weight of the solid matter would be 3 pounds mutliplied by $\frac{5}{3}$, or 5 pounds. If the flow of the stream is known, a calculation can be made showing the amount of suspended matter being carried by the stream at the time the test is made.

An interesting experiment on muddy waters may be made by taking

three glasses of the water and pouring into one a teaspoonful of salt and into another a teaspoonful of powdered alum and stirring them until the salt and alum are dissolved. Stand the three glasses where they will not be disturbed and note the difference in the times required for the water in the glasses to become clear.

To test whether the stream is carrying matter in solution, take a measured quart of the water from the stream when it is clear, and evaporate it by slow boiling and note the amount and character of the deposit, if any, formed in the vessel. Test the deposit with acid. Effervescence indicates carbonates, probably of lime.

The formation of soil: The decay of rocks and the formation of residual clay and soil may be studied almost anywhere in the foothills and mountains, and at many places on the plains, especially along stream gorges and valleys. In the mountains select a rather level area in such a position that the decaying rock would not be readily carried away by wind and rain, and where it would not be greatly added to by matter washed or rolled in from the surrounding rocks. If the spot is covered with grass, it will be found that the soil at the roots of the grass will be more or less darkened, possibly almost black, from the presence of decaying plant matter. Deeper, it is lighter colored, coarser and more gritty, and gradually passes into rusty, angular, pebbly or coarsely granular material. Still deeper the proportion of fine material becomes less and less, and blocks of partially decayed rock appear and finally the solid rock is exposed. A very interesting collection may be made showing the various stages in soil formation, from fresh rock to soil supporting vegetation.

On the plains it is possible to find places where the streams have cut down into the rocks and have left them exposed. In such places one may sometimes trace the change from a solid rock below, to a more and more broken and decayed mass and finally upward into clay soil.

Briefly stated, the process of soil-formation is as follows: Most rocks are made up of grains of two or more minerals, and the minerals themselves are made up of simpler substances called elements. Water, the gases of the atmosphere and the substances formed by the decay of plants, all tend to unite with these elements and form new compounds, many of which are easily soluble and are partly or completely washed away to the rivers and carried to the sea. Others are less soluble and remain longer, and still others are almost insoluble. These last are the principal soil-formers, but with them, especially in dry regions, small quantities of the soluble salts remain. This soil material may accumulate and form a thick covering over the rock from which it is formed, or it may be carried away by wind and water and laid down elsewhere. Much of the mud of stream channels is fine soil material which has been washed down into the valleys and is being caried away to the sea. If the rock is seamed and jointed, air and water get at it more easily and the work of decay goes on faster. Freezing and thawing and other changes of temperature cause fine fracturing and so hasten decay.

Alkali: The white substance called alkali is a mixture of vairious soluble salts formed by the decay of rocks in the process of soil-formation. In regions of abundant rainfall these soluble salts are washed out of the soil and carried to the sea by the rivers, but in dry regions the washing is not

complete. The salts are principally those of sodium and potassium. The most harmful of these is the carbonate of soda, known as "black alkali," not because of its color, but because of its effect on plants.

(a) Under what conditions does the alkali appear on the surface of the ground.

(b) By what means is it brought to the surface?

The following experiments are intended to show the effect of alkali upon plant life. The composition of alkali varies widely from place to place, and its injurious effects vary with the composition. In some localities the black alkali is not present, but in others it may be very abundant. The proportion of alkali to soil suggested in these experiments is 2 to 96, or about two per cent. This has given satisfactory results with alkali of average composition. If the results are not satisfactory the percentage of alkali should be increased or decreased.

Collect half-a-pound of alkali and weigh out six lots of one ounce each. Secure a quantity of soil free from alkali, and get seven common red earthen flower pots with saucers, each large enough to hold three pounds of soil. Number the pots carefully and fill them as follows: place one of the lots of alkali in the bottom of number one, and another in the bottom of number two, and then fill them with the alkali-free soil; fill numbers three and four and stir thoroughly into each of them one of the lots of alkali; fill numbers five, six and seven and plant barley in all seven, putting eight grains in each pot. Sprinkle one of the lots of alkali on number five and another on number six, and leave number seven entirely free from it. Water them whenever they need it, using as nearly as possible the same amount of water on each, but do not water any one more frequetnly than the rest. Always give the water to numbers: 1, 3, 5 and 7 by pouring it on the top of the pot, and to numbers 2, 4 and 6 by pouring it into the saucer. Keep a record of the results, noting carefully the following points:

a. The appearance and disappearance of the alkali in the different pots.

b. The time when the plants came up in the different pots, and their growth and progress by measurements.

c. The effect of the different methods of watering on the growth of the plants.

Another series of experiments could be made to determine the effects of different quantities of alkali on different kinds of plants.

Plant and animal geography. The study of the ditribution and habits of plants and animals is one of the most interesting kinds of field work, and while a knowledge of species and varieties is very helpful, much instructive work can be done without it, especially if it is possible to secure the co-operation of the teacher of biology. The following outline is intended only to indicate some lines of work. It may appear to trespass the field of biology, but in a broad sense biology is the story of geography told in the language of life. An intelligent understanding of either science necessitates a careful study of the response of organisms to environment and the effect of environment upon organisms.

A. Plant classes:

a. Trees and shrubs:

(1). Leaf trees.
(2) Needle-trees—trees with needle-like leaves.

b. Herbaceous plants.

B. Regional distribution:

a. Mountains:
(1) Alpine—above timber-line.
(2) Sub-alpine—9,500 to 11,000 feet above sea level.
(3) Lower slopes, from the plains up to 9,500 feet.
(4) Mountain meadows and parks.

b. Foothills and plains:
(1) Canyons.
(2) Hillsides and mesas.
(3) Open plains.

C. Distribution relative to exposure to sun and wind:

a. Vegetation on various slopes.
b. Height of timber-line and its relation to sun, wind and movement of atmospheric moisture.
c. Effects of shade on the holding of moisture and on plant distribution.
d. Wind timber.

D. Influence of man:

a. Effects of cultivation of the soil:
(1) Introduction of new plants.
(2) Disappearance of certain plants.

b. Effects of irrigation.

c. Effects of railway and highway building:
(1) Introduction of new plants by migration along railway and highway.
(2) Vegetation of new cuts and fills.

d. Effects of removal of timber trees on:
(1) Other trees and shrubs.
(2) Herbaceous plants.

E. Relation of vegetation to soils:

a. Vegetation of sand and very sandy soil.
b. Vegetation of residual clay.
c. Of loam, alluvium and vegetable mold.
d. Of boulders and bare rocks, (mosses, lichens etc.)

F. Relation of vegetation to the amount of moisture:

a. Stream border, swamp, bog and meadow types.
b. Plain types.

G. Seasonal progress and development:

a. Effects of slope, shade, altitude etc.
b. Spring flowering plants, summer flowering plants etc.

H. Relation of vegetation to underlying rocks.

I. Plant geography: One plant map of the vicinity might show by different colors, the distribution of needle-trees, (conifers), leaf-

trees and shrubs. A second could show the distribution of herbaceous plants. Different localities would show more or less definite groupings.

Base maps suitable for such work might be made by enlarging land office maps or the topographic maps issued by the U. S. Geological Survey.

Animal life:

The principal groups are:

1. Mammals. (The group includes all hairy quadrupeds).
2. Birds.
3. Reptiles. (The group includes snakes, turtles, the horned toad, gila monster, etc.)
4. Amphibians. (The group includes frogs, water-dogs, (salamanders), etc.)
5. Fish.
6. Worms.
7. Molluscs. (The group includes snails, clams, etc.)
8. Arthropods. (The group includes crustaceans, centipedes, insects, spiders, etc.)

How is the distribution of each group influenced by:

a. The presence or absence of timber?
b. The supply of moisture?
c. The topography—plains, foothills and canyons, mountains?
d. The nearness and work of man?

Each of the groups may be studied under the general headings:

a. Range, migration, both local and distant.
b. Summer life.
c. Winter habits, color changes, etc.
d. Stages in life development.
e. Food and supply.

Local trade geography. The commercial geography of even a very small part of the State is much more complex and far-reaching than we are accusomed to consider it. For the supply of our daily needs we are dependent not only upon other parts of our own state and country, but also upon foreign countries. And when we consider the question of luxuries we find ourselves in touch with the whole world. Some of the many topics which might be considered are:

1. The location of towns, trading centres, trade routes:
   a. Why are they where they are?
   b. What conditions contribute to their growth and prosperity?
2. The sources of our food supply:
   a. What foods come from local farms and gardens?
   b. From other parts of the state?
   c. From other states?
   d. From foreign countries?
3. Clothing of all kinds:
   a. Whence come the raw materials: wool, cotton, silk, flax, leather?

- b. Where are the centres of the manufactures and distribution of these materials?
- c. What clothing goods do we import, and from what countries do they come?
- d. What trade routes do they follow in coming to Colorado?

4. Our fuels, the kinds, sources, cost etc.
5. Building materials:
   - a. Whence do we get our lumber?
   - b. Our clay products and cements?
   - c. Our stone, slate, marble?
   - d. Structural iron, steel, nails, locks, etc.
   - e. Glass, paint and other decorative materials?
6. Our furniture, stoves, grates etc.
   - a. What woods and metals are used?
   - b. Where are the centres of manufacture, and why are they so located?
7. Machinery: Colorado uses a large amount of machinery in her mines and factories and on her farms. A study of the sources of supply leads naturally to the question of the centres of machinery manufacture, the centres of the iron and steel industry, the sources of the iron ores and the fuel used.
8. The exports of the state, and the freight passing through to the east and to the west, and its destinations.
9. The history of Colorado's many mineral products after they are taken from the mines.
10. The influence of topography upon trade, trade routes, and the occupation of the people.

NOTE.—Some of the more important instruments used in the study of meterology are: Thermometer, $1.50 to $2.75; Maximum and Minimum Thermometers, $5.00 to $8.00 for the pair; Mercury Barometer, $6.00 to $12.00; Hygrometer, $5.00 to $7.00; Rain Gauge, about $3.50 Some of the books are: Davis, Elementary Meterology. Ginn & Co., $2.50; Ward, Practical Exercises in Meterology, Ginn & Co., $1 45; Waldo, Elementary Meterology, Am. Book Co., $1.50; United States Weather Bureau, "Instructions for Voluntary Observers," "Barometers and the Measurement of Atmospheric Pressure," "Instructions for Obtaining and Tabulating Records from Recording Instruments."

HISTORY IN THE SECONDARY SCHOOLS.

By FREDERIC L. PAXSON, Ph. D.
Professor of History.

The place of history in the curriculum of the secondary school has been changing rapidly during the last twenty years. It is no longer at the bottom of the list of studies and assigned to some instructor who happens to have a vacant hour at a suitable time, but it is recognized as possessing a distinct quality in education. And as the schools are finding themselves able to employ specializing instructors, history is advancing to a prominent place among studies in value and popularity.

History is among the small number of subjects that possess at once marked value in utility and training. Its practical value to the citizen may be expressed negatively in the idea that the state cannot afford to have its people untrained in the records of its past. Present day measures are dependent for their success upon intelligent consideration of past precedent; while training undergone in the careful study of history cannot fail to make for caution and conservatism in the conduct of public affairs. The training which the study entails, if it be properly directed by competent instructors, producers at least a tendency towards a judicial consideration of political questions.

Secondary students fall into two classes when divided with reference to their demands upon the teacher of history. The large class of students whose school days end with the high school, presents a more emphatic demand for consideration than does the minority group of those whose high school is merely a preliminary step to further and more thorough study in college. The latter class will in large measure take care of itself. It is not dependent upon the secondary instructor. But the individuals of the former class must acquire the historical method in the high school if they are to acquire it at all. The cases are relatively few in which individuals learn to put themselves into the historical attitude without direct instruction and training.

The task of providing adequate training for the child who goes into work at eighteen is the most difficult problem of the teacher of history. The work is hard enough of itself, yet is further complicated by the mutilation of the high school course in the interest of college preparation and by the youth of the student which raises difficult questions on the pedagogical side of the work. Yet it is not impossible to give to this student a rational attitude towards historical problems. He must be taught first and most forcefully that his text book is not either history or final; that it is merely the opinion of a single man as to the nature and significance of events; that other men may and do come to radically different conclusions on the same collection of facts. When once he has been brought to realize the absence of the

absolute standard in history the student is well started away from preconceived opinion and prejudice, and towards the true historical attitude. The next work of the instructor is to teach him where and how to find the truth on a special point, a task which leads to some examination of the sources of history, and some comparison of conflicting sources. The ability to use texts, general works and reference books independently and successfully can be taught more easily in connection with history, perhaps, than with any other subject. And the ability once acquired can be applied to anything. No child who comes out of high school knowing how to find the information he needs can be said to be uneducated.

For the student whose study ends in the high school, the task is to impart a brief outline of definite facts, and to teach the method of non-partisan investigation. The future college student needs both more and less than this. In view of his opportunities for more advanced work he has not the immediate necessity for training in what may be called historical method. He can afford to put that off for a year or two. His great need is to acquire elementary facts. The training in methods is done at a disadvantage in the high school because of the immaturity of the student. It must be given to the former class at whatever cost. But the student preparing for college is better off if his time is devoted to the building of a solid foundation on which to base his future work.

During the last twenty years there has been a great change in the character of historical work done in America. The names of Channing and Hart of Harvard, of Adams of Johns Hopkins, of McMaster of Pennsylvania, and of Turner of Wisconsin are most intimately connected with this change. Starting in the university the more careful teaching of history has established the subject in the advanced curriculum; while the men trained here have carried the work into the college and are now laboring with the secondary school. Some nine years ago the American Historical Association approached the problem with such success that the secondary school now possesses a definite platform for historical instruction.

The division of the historical field among the four years of the high school must vary with the place and the wealth of the school and the temperament of those in control. Not even a semblance of uniformity prevailed throughout the United States five years ago. The traditional text book course in general history was perhaps the most widely used; and various sketches of English, American, French, European, Greek, Roman and ancient history appeared from place to place. There was greater uniformity in quality of text books and instruction that in subject of courses, but unfortunately the uniformity was that of inaccuracy and prejudice in the former case, and of lack of preparation in the latter.

In the winter of 1896 a Committee of Seven was appointed by the American Historical Association to investigate the teaching of history in the high school and to recommend a uniform course. Its report on **The Study of History in Schools** was drawn up with great care after an examination of American and European practice, published by Macmillan in 1899, and is in process of general acceptance by the American schools today. The four unit courses recommended in this report have been adopted by the North Central Association of Colleges and Secondary Schools and constitute the units which

may be offered for admission to the University of Colorado.

The report of the Committee of Seven outlines four courses of history which together cover the whole historical field. The first, which is intended for the first year in the high school, is in ancient history, including the eastern nations, Greece and Rome, and coming down to the formation of the Empire of Charles the Great in 800. This unit is perhaps the most difficult to adopt because of the great period which it covers and because of the change it institutes in condensing the field of ancient history. The idea prevails throughout the report that the study should become more detailed as it approaches the present time. The second unit course covers mediaeval and modern European history, and, beginning with 800, comes down to the present day. The third course covers the special field of English history. American history and civil government together constitute the fourth year of the course. They are placed here with the deliberate intention that the student shall leave the high school with the facts of the history and government of his own country most firmly fixed in his mind.

It is not to be expected that every high school shall be able to employ a special teacher to give all of these courses but they are believed to make up the most useful scheme. When a specialist can be employed. the best results will be obtained. When all of the courses can not be given one or two of the parts can be offered with the best advantage. Two units of history are required for admission to the University of Colorado, and in cases in which the high school can teach only two, the second and fourth courses are believed to be the best.

Much has been written during recent years concerning the methods which ought to be used in this secondary teaching of history. Individual teachers have been successful in their use of many different methods of procedure. Some have found the best results produced by strict adherence to a standard text, others have used several texts in the same class, others have abandoned the text and have resorted to topical work in reference books, and still others have used selected sources as the basis of their work. Most of them have had constant recourse to note-books. maps and individual reports.

The mastery of a good text is perhaps a necessary step in elementary historical work. It is not to be forgotten that the text is at best only a partial view of history, but the immature mind can not well construct a connected narrative without the text for a foundation. It is the place of the teacher to emphasize the shortcomings of any text by reference to the other sources and methods of instruction. But the text should be the starting point for divergences. In the hands of an unskillful teacher this dependence on a text reduces the chance of bad work to a minimum; while with the trained teacher there is no difficulty in correcting mistakes into which the class may be led by a too complete acceptance of its authority. The work will be made richer if there be access to several texts in order that the student may get the benefit of different points of vantage and gain a true appreciation of the fact that the real history is outside the book. But it may be doubted whether the best results can be obtained if the text is not generally in the hands of all the students. It is hard to hold a class together if they regularly study different books.

Topical work should be resorted to as often as may be. In this work special topics are assigned to different members of the class, and they are required to make use of reference works in the preparation of reports to the whole class. The benefit to the class from these reports is naturally not so great as might be hoped but the benefit to the reporting student is beyond estimate. Some teachers believe so thoroughly in this method that they throw aside the text and do all the work through individual topics. This entails a great danger of leaving the student without a consecutive knowledge of anything. At best it requires a better instructor than most schools can obtain and at the normal it is a snare and a delusion.

A few teachers feel the danger of the authority of the text so fully that they use a series of selected sources in its place. There is no question but that the student should learn that history is recorded in laws, treaties, newspapers, memoirs, letters, biographics and the like. But the student cannot weigh enough evidence in the time of a unit course to derive much information from the source. He gets a one-sided view of a few events and nothing more. The place of the source in secondary history is in the hand of the teacher, who should use it to illustrate various points as they appear and to show the class what a source is. At times it is safe to have the class read one or two sources, subject to the careful interpretation and comment of the instructor. But the secondary student can not use sources to any great extent. He should see a few, as it were, sample sources, and then take the rest for granted by following a text.

The historical note-book should generally be used. It should always be made of detached leaves so that interpolations may be made at any time or place. In it the student should be required to collect notes on his text, notes on his topics, notes on the comments of the teacher. One of the purposes of historical work is to teach the child how to gather and use information, and for this purpose the note-book is invaluable. There are two sorts of topics in which the student should receive note practice. One is the topic covering a long period of time, as the Holy Roman Empire or Slavery in the United States, in whose preparation the student must select his facts and learn to discard the non-essential. The second is the descriptive topic, as the Declaration of Independence or the Diet of Worms, in which the task is to gather from all the sources he can find facts relating to a single event. The well made note-book is as important as any single element in historical study.

Geography is the physical foundation of history. The colonization of America can not be understood without constant reference to the contour of the Appalachian range, the insular position of England is the key to much of her constitutional and economic development. The Nile gave shape to the whole government and civilization of Egypt. Unles sthis connection is impressed upon the mind of the student this history is in danger of losing its definite quality. The class should be conducted with the map spread before it, while the student should be made to learn to read his map as easily as his book. If the student is also required to reproduce important maps, he gains much. It is not desired that he shall be forced to copy the outlines, for there is a difference between history and drawing. But by frequent use of the inexpensive outline maps, such as those made by the McKinley Publishing

Company, of Philadelphia, his knowledge of history and geography can b developed at the same time, and to the advantage of both. The separate leaf note-book is the proper resting place for the completed outline map.

Since the publication of the **Report of the Committee of Seven,** there ha been activity in the preparation of text books which shall conform to th needs of the courses there outlined. All of the books thus produced hav a high degree of merit and are far beyond the older historical texts in prc portion, scholarship, impartiality and mechanical construction. Most of th prominent text book publishers have started, and several have completed series of texts to provide for all the unit courses. No series however con tains the best books for all of the several courses.

With respect to the unit in ancient history there is a tendency to prc duce three different forms of book. Thus G. W. Botsford, in the Macmilla series, has a **Greece, a Rome** and an **Ancient History;** Professor W. M. Wes of the University of Minnesota, writes the books for this period for Ally and Bacon; Arthur Wolfson prepares the **Essentials in Ancient History in th** series of the American Book Company; while Myers has re-edited his olde texts to meet the requirements of the **Report.** All these texts are far bette than any of the earlier period. But it seems likely that the satisfactory tex on ancient history is still to be written.

The next texts for the second period are perhaps headed by J. H. Robin son's **History of Western Europe** (Ginn). But this is so closely followed b Munro and Whitcomb's **Medieval and Modern History** (Appleton), and G. B Adam's **European History** (Macmillan), and West's **Modern History** (Alle and Bacon); that the precedence is doubtful. All of this group suffer fron being too far advanced for tenth grade work where they are expected to be used. Good teaching, however, can make this difficulty a stimulus rathe than a hindrance.

Leadership in the English history course seems to be contested by C. M Andrews's **History of England** (Allyn and Bacon); and E. P. Cheyney's **Short History of England** (Ginn). But Wrong's **History of the British Natior** (Appleton), and Coman and Kendall's **History of England** (Macmillan), are both excellent books.

The American history course is best provided of all the units. Edward Channing of Harvard, whose work has done so much to direct the new school of history teachers, leads with his **Student's History of the United States** (Macmillan). But the field is by no means exclusively his own, foi both McLaughlin's **History of the American Nation** (Appleton), and Adams and Trent's **United States History** (Allyn and Bacon), are both accurate and useful.

The new texts prepared in accordance with the Report of the Committee of Seven are generally far ahead of the texts that preceded them. They are the work of more carefully trained scholars and reflect less of indolence, sectionalism and jingo than the earlier group. A personal opinion arranges them in the order given above, but it must be remembered that every one has its partisans who are using it successfully and who place it at the head of its class. With the place of history in the high school stated, with its courses defined and its methods described, and with its texts enumerated, the final question remains as to the sources from which the instructor shall

draw his inspiration and guidance. It cannot be hoped for a long time to come that every history teacher shall be a trained specialist drilled in bibliography and methods. Most teachers must be content to take this inspiration at second hand.

The most recent and helpful book for the teacher to own is **A History Syllabus for Secondary Schools**, prepared by a Special Committee of the New England History Teachers' Association, and published by Heath in 1904. ($1.20). This syllabus contains detailed instructions for the guidance of teachers who are following the recommendations of the Committee of Seven. Its general introduction is filled with pertinent suggestions as to the general conduct of the work, while its subsequent four parts follow in detail the four unit courses with suggestive topics, references and bibliographies.

The more general literature of secondary historical method begins with the Report of the Committee of Seven, and goes on through the works of Bourne, Channing, Hart, Hinsdale, Langlois, Seignobos and Larned which have been drawn upon so freely in the preparation of this paper. The works on historical geography of Freemen, Semple and Bingham are invaluable in their treatment of this phase, and are within the reach of the high school library. Scattered through the **Syllabus**, above cited, are bibliographies that will open the whole field to the interested teacher.

When all has been said with respect to history in the secondary school, one great fact stands out: it is the purpose of this instruction to broaden the mind of the student and break down the barriers of pre-conceived opinion, to teach him to question the general statement and to verify or disprove it by honest reference to the best available sources of information. And the teacher will be successful just in proportion as he acquires these qualities which he is seeking to impart.

THE TEACHING OF BOTANY AND ZOOLOGY.

By FRANCIS RAMALEY, Ph. D.
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It goes without saying that a good teacher is necessary if there is to be good teaching. The great difficulty of securing good science teachers in high schools comes from the fact that the teacher is worked too hard. Superintendents and principals have usually no appreciation of the time required in looking after a laboratory. They expect an instructor in science to do as much class work as instructors who have no laboratory to keep in order and to supply with material. The writer has known many young men and women who left the University with an enthusiasm for science but who have settled down to teaching other branches in the high school—branches in which the demands on time and strength are not so great.

There is one mistake which the young high school teacher, fresh from college, is likely to make. If he has had a modern morphological course in botany or zoology he thinks he must give the same kind of a course to his own pupils. But he forgets that maturer judgment and better trained minds are necessary to appreciate the work which he undertakes to give.

Long continued use of the microscope is hardly desirable for children who have, by no means, learned to see all they might see with the naked eye. It is seldom that a high school provides enough microscopes for each pupil to have one to himself. Unless this can be done the pupil cannot be expected to really learn the use of the instrument in the time allowed for laboratory work. College students, who have used the microscope for one or two years, often fail in the manipulation of it. What then shall we expect of young people in the high school?

Where only one or a few microscopes can be obtained successful demonstrations may be prepared, and the pupils may take turns in looking at the object. But even in this case the use of low powers is to be encouraged. The hand lens and the dissecting microscope are of great use. Six dissecting microscopes may be obtained for the price of one compound microscope.

Instead of a large amount of energy mostly wasted in microscopic work the pupil would better be spending the time in getting acquainted with the gross structure of plants and animals. Work on animals may be largely confined to the study of external features. For various reasons minute dissection is not advisable. So far as possible the food habits, mode of life and distriubtion should be observed and studied.

During our long winters it is not possible to get out into the field. On this account it is necessary to have a large amount of plant and animal material preserved for use. It is in this particular that almost all schools are deficient. The teacher cannot gather enough material. This must be bought

and must be bought each year, since a large amount is used by every class. This requires money; but no kind of laboratory work can be undertaken without money. No one would think of running a chemical laboratory without chemicals. Is it not rather curious that superintendents and school boards expect natural history to be taught without plants and animals?

Every high school in which botany is taught should be provided with herbarium specimens of the commonest plants of the region. A good collection of material illustrating the various plant groups ought to be on display where the pupils could see the plants every day. There should also be an abundance of dried specimens for study and dissection, besides alcholic material of things which are too much injured in drying. More attention should be given to plants of economic value. There should be none of that fine contempt for cultivated plants which used to be so common among high school teachers. Pictures of plants in their natural surroundings should be obtained and regularly used. Where classes are large a projection lantern is a necessity, but with smaller classes photographs may be passed around from hand to hand.

Equipment for work in zoology may well be of a coresponding nature to that suggested for plant study. Here, however, there must obviously be more alcoholic material and fewer dried specimens. All branches of the animal kingdom should be represented by specimens and these should be so displayed that the pupils may see them at any and all times. It is necessary also to have a good supply of those particular species which are to be studied in some detail. Photographs are essential to good teaching and a collection of colored pictures of birds and butterflies ought to be provided.

A course in botany or zoology should furnish training for the eye, hand and brain. It should impart information on the hundred and one things which the modern man or woman needs to know about plants and animals. It should teach the boy or girl to "see things as they are," not to observe hastily nor to draw rash conclusions. It should inculcate a desire for further knowledge. When the pupil describes, or makes a drawing of something stuied his description or drawing should show just what he has seen. It should be truthful. He, himself, will thus, in time, come to be truthful by habit. If there be anything more essential in education than to foster truthfulness the present writer has not discovered it. If the pupil does not learn to see "things as they are;" if he does not acquire ability to describe things truthfully; then so far as that pupil is concerned the course has been a failure.

MODERN LANGUAGE IN THE CURRICULUM OF THE HIGH SCHOOL.

By C. C. AYER, Ph. D.
Professor of Romance Languages.

In the high schools of Colorado are taught German, French and Spanish. In a few of the leading schools all three are taught, in others only two, and in still others only one. The financial condition of the community concerned has to govern the policy pursued. In by far the great majority of schools German is regarded as the modern language par excellence. The reason most frequently heard is that it is the most practical of the modern languages. Just what is meant by practical is not easy to say, but the word appeals to most people, and a discussion of it later will be well worth while. French is taught in only a few of the high schools; once the favorite modern foreign tongue in schools where German was yet to be introduced, it has fallen out of the curriculum, especially in practical-minded communities, or perhaps in communities where the slim purse dictates. Spanish, on the other hand, though until very recently, a remote tongue with little interest for the English-speaking American, has now, at least in the State of Colorado come into popularity which is steadily increasing, and this too for practical reasons, or at least supposedly practical reasons.

Let us consider for a moment what we mean by practical. To say that German is practical amounts to saying that German immigration has brought into the country a large German population, which is well worth cultivating for purposes of business. To say that French is not practical is to take cognizance of the fact that a Frenchman is a comparative rarity in the United States and a French community so rare that it need not be reckoned with at all, whereas to say that Spanish is practical is to recognize that many of our young men may be forced to seek their living in the as yet unexploited mines and plantations of Mexico and the Philippines, in the midst of people to whom English is and perhaps ever will be unintelligible. These young men who go away to foreign lands to do business will therefore need the foreign language of the country to which they go. But how many ever go to Germany for that purpose? How many ever go to France? Practically none. Therefore the acquirement of German and French need not necessarily be regarded as a practical stroke on the part of the high school student. We hear it constantly stated, and often with arrogance that our English is to conquer the commercial world and this boast seems, furthermore, to be well justified. English is recognized as a business requisite by the enterprising business houses of Europe and it must be admitted that in the majority of cases, the foreigner becomes more proficient in the use of English, than we do in any given foreign tongue. Is, therefore the acquirement of a modern foreign language as practical an achievement as we perhaps imagine? Is a foreign tongue an appreciable aid to material success

in life? Are our rich men linguists? Has German, French or Spanish helped them to their wealth? Is finally modern language study of practical value in a popular education for those Americans who are not going to be compelled to make use of it later? Does not the high school curriculum offer subjects more necessary to the youth of the country? Perhaps. But in any case, whatever variety of subjects may be introduced into the high school curriculum, and modern pedagogy is constantly pressing forward the claims of new subjects, modern languages are now firmly established in the program of high schools not only in this country but abroad. Even the most conservative classical schools are making concessions to modern language study. And in the best schools the concession is being made not entirely in response to a sordid demand for something utiliarian. The concession is made on realizing that the modern languages, if properly taught, furnish an abundant field for mental training. While it is true that owing to certain conditions, the discipline is at present not so severe as it is in the study of Greek and Latin, yet there is no good and sufficient reason why German, French, or Spanish may not be administered with precisely as much severity as the classical languages. And on the severity with which the modern languages are administered, will depend the success of the results. In high school classes in Greek and Latin, no special attempt is made, to make the study attractive, and there is no reason why such attempt should be made. Greek and Latin are difficult work, and not play. There is no reason why they should be treated as play. They are serious subjects in secondary school work. They are what give calibre to the high school mind, calibre which will later in life take on true culture. And ultimate success in classical study is out of the question, if hard work in declensions, conjugations and syntax has not been done during the high school course, and if translations have not been made into good English under the supervision of a teacher who knows good English, and not only knows good English but uses good English at all times and under all circumstances, and insists upon good English in the class room, and out of it too, if possible. These suggestions with reference to classical teaching may apply without modification to modern language teaching. In other words the instruction in modern languages must be as serious as it is in ancient languages. I am well aware that a modern language hour may be made entertaining, and thereby do injury to a class. Two pleasant years spent in the study of German or French are all too apt to prepare the high school graduate for the ultimate realization that he does not really know the elements of those languages, that the battles have not been fought. The study has not been taken seriously. Perhaps the modern living language, taught by a German with a queer pronunciation of English, or by a Frenchman with a shrug, has furnished only an hour of fun. This need not necessarily be the case. Other things being equal, there is no reason why a native German or French teacher should not make his hour a period of strictest discipline. But if he puts on the screws, he might lose in popularity, and among undiscriminating pupils of high school age, the interest in modern language study might flag. The same reasons which cause certain students to drop the classical course, should find the same grounds in the modern language course.

As before stated syntax, declensions and conjugations, and translation, just as in Latin, should be the work of the high school in modern languages.

The student entering college after two years of daily class work ought to be ready for an advanced course in college. In addition to his proficiency in the elements mentioned above, he should also bring with him a corect pronunciation, not only practically correct but theoretically correct. A phonetic primer wil furnish the student with the theorems of the best pronunciation, which will be substantially as reliable as so many theorems in geometry. By means of these theorms a respectable pronuniciation may be expected. Furthermore, the mastering of a phonetic system is not nearly as difficult as many apathetic persons are inclined to imagine. To be sure, there are puzzles and problems of pronunciation; but of what use in the development of the mental faculties, is a subject which presents no puzzles or problems? Why reject a scientific system which at least tends to solve them in the most accurate and satisfactory manner?

The teaching of modern languages in the high school encounters several difficulties not experienced in the teaching of the classics. There is the German-American child who speaks a bastard German to the admiration of beginners, and there is the semi-fashionable American child, who has somewhere acquired a smattering of French. These are two unruly elements, whose influence is disheartening to a well meaning class. They, first of all, are in need of serious discipline.

There is still another obstacle, which stands in the way of successful modern language aeaching in the high schools, and for that matter in the college as well, it is the indifference on the part of the teacher to good English, Slipshod English seems to be a characteristic of much of the best society in many communities. Many persons do not realize that good English is of more account than good clothes. The standard is not high. Perhaps it is not strange that the teacher does not use English creditably. Nevertheless it is true that the person who is not careful of his mother tongue will never do justice to any foreign language either in speaking it or in teaching others to speak it.

In this last connection the general qualifications of the modern language teacher in the high school, deserve discussion. It sounds trite to suggest that the teacher be competent for his work. Nevertheless a good German or French teacher should have trustworthy recommendations. He should not be some person, who steps hastily into a vacancy created, out of some quite different department of instruction. Neither should he be a man who is using his position as a makeshift, with his mind turned towards law or medicine as an ultimate career. These conditions unfortunately prevail to a considerable extent, and they will continue to prevail in those communities where the pay is poor, tenure of office uncertain, and politics are interwoven. It is gratifying, however, to notice that in the more flourishing schools of the state, more stable conditions are now obtaining, with the result that very excellent modern language students are entering the State University.

The modern language question in the high schools, how is it to be solved? By realizing that many and varied elements are involved, idea and ethical, commercial and utilitarian, political and sociological. Whether these elements can or should be reconciled amongst one another, and to what extent, is a question which may well be left to the experience and conscience of the powers that be.

PHYSICS IN THE HIGH SCHOOL.

By CHAS. A. LORY, M. S.
Acting Professor of Physics,

The proper place of Physics in the High School curriculum is in the third or fourth year. The pupil should have had a good course in algebra, extending through ratio and proportion, and at least some construction work in plane geometry.

The arrangement of three recitation periods and two double periods in the laboratory per week is in general very satisfactory. The schedule of hours should be elastic enough to permit the use of the laboratory hours for recitation work whenever this seems necessary. This is especially desirable at the beginning of the year.

Each teacher must work out of his own method of presentation. Some succeed better with a lecture course, others use the definite assignment of work, and quiz method, or perhaps a combination of lecture and quiz; from a general standpoint the last seems the most desirable. High School pupils can scarcely be expected to take accurate notes in a straight lecture course. Even where notes are taken, without frequent quizzes there is little incentive to their conscientious study. The method of requiring careful study of a definite assignment, and then illustrating the principles involved, with demonstration experiments, and clearing up the difficulties with judicious questioning and explanation is perhaps the most successful.

A reference library, consisting of a number of different texts on Elementary Physics, and one or more scientific journals should be placed in the study or library so it can be constantly used by the class. Reference reading should be assigned with every lesson and a report called for in the next recitation.

The question of practical problems upon the principles developed in each recitation is an important one. No other agency is so potent in securing their clear understanding. It would be no more absurd to attempt to teach arithmetic or elementary algebra without the use of illustrative examples, than to give a course in elementary physics without a liberal use of problems. A limited number can be assigned with each lesson and a report required. Where, as is often the case, the recitation room is not well provided with black-boards, two problem books can be used, one being handed to the teacher for correction each recitation, the other returned to the pupil at the same time.

In the subject matter it is far more important to thoroughly master the fundamental principles than to sacrifice clear understanding in order to cover a greater range. This is especially true in mechanics. For most pupils this is the most difficult part of the subject and especial efforts must be put forth to secure clear concepts. It is not sufficient that the principles

be clearly understood, the pupil must have a good working knowledge and be able to use them in his reasoning. It is far better to give extra time and make sure that the laws of motion, the concepts of force, mass and inertia are clearly understood and definite, than to be forever explaining them through the year.

The law of the conservation of energy can be well illustrated in the fundamental law of simple machines, and the ideas of mechanical advantage and efficiency cleared up by the liberal use of problems.

In the mechanics of fluids the subjects of density, specific gravity, and pressure should receive special attention.

The phenomena of heat are best explained from the standpoint of molecular energy, and the methods of measuring temperature and heat, the fundamental principles of the kinetic theory of gases and the general gas law, and the first law of thermodynamics should be emphasized.

The phenomena of static electricity can readily be presented from the standpoint of ether stress. Extra care must be given to the subject of potential. This subject will have lost much of its difficulty if the idea of measuring a quantity in terms of work has been developed in mechanics, and equipotential surfaces explained in mechanics of fluids.

There is a strong tendency to spend too much time on dynamic electricity, probably on account of the widespread interest in the subject. A good understanding of he basic principles is necessary but it is a mistake to give extra time to electricity at the expense of sound and light, especially when, as is quite often the case, this necessitates the omitting of the latter entirely. This same tendency is not confined entirely to the high schools, so that it is quite possible for a student to complete the general course of physics in college and not devote more than two or three weeks to light. This is, to say the least, unfortunate for this branch of the subject is just as important as any, and the problems of wave motion, of reflection, refraction and interference lend themselves readily to demonstration, and are especially adapted to test the ingenuity of the pupil.

The aim of laboratory work is first; to permit the pupil to test certain laws for himself, second, to give him a certain acquaintance with, and skill in the use of apparatus, third to develop habits of accurate observation and to inculcate the investigating spirit. In planning a series of experiments the rule that a limited number of experiments well performed is better than to sacrifice quality for quantity is a good one. Wherever possible, provision should be made for determining the object of an experiment by two separate methods, this gives the pupil a check upon his own work, and is a great incentive to painstaking effort. The pupil has a right to expect that the course shall give him a working knowledge of the ordinary measuring apparatus of the laboratory.

As a general rule, an experiment to be most efficient, must be assigned in advance so that the theory can be studied before the pupil comes to the laboratory, the data must be carefully taken, neatness and accuracy observed in tabulation and calculation, and sufficient description given in good English that it may be used as a guide to check up the work step by step.

The question of laboratory equipments is usually a serious one. Cheap

apparatus is a nuisance, and the purchase of much high-priced apparatus to be stored away for show and never used, a waste. A few standard pieces, as for example a good balance, an air pump, thermometers, static machine, primary cells, magnets, galvanoscope, resistance box, experimental dynamo, sonometer and spectrometer should be provided. Of equal importance is a shop equipped with a small leathe suitable for wood and metal work and a limited kit of tools. For demonstration purpose simple apparatus constructed by the teacher is often even better than expensive pieces. The pupils, especially the boys of the class will take added interest if called upon to help in this construction, or if given the opportunity to use the shop to make some appliance of their own design.

A course in high school physics should give the pupil a clear understanding of the fundamental principles of the science. It should develop his reasoning faculties and increase his ability to grapple with practical problems. It should give him some skill in the manipulation and construction of simple apparatus. It should develop a desire for investigation. Most important of all it should impress upon him the fact that science is a search for truth, and that our knowledge of nature can only be advanced by patient investigation, and the practice of absolute honesty in every observation.

ECONOMICS IN THE HIGH SCHOOLS.*

By JOHN B. PHILLIPS, Ph. D.

If we define wealth as that which satisfies human wants the problem that is most in need of solution is how to increase its production. This production is no longer limited by human strength. In early times machines were unknown and the amount of wealth that could be produced was limited by the strength of the human animal. By the aid of machinery it is now limited only by the forces of nature. The great problem is to so train our citizens that they will be able to produce more wealth and at a continually lessening expense of energy.

To increase national greatness is to increase the wealth and welfare of the population and for this purpose public education has been provided by the state. The studies that should be taught in the public schools are those that will contribute most toward this end. What is national welfare and what are the things that contribute most largely to it? The welfare of a country is chiefly due to the following causes:

A strong and healthy population.
Skill in invention and organization.
Capacity to use labor-saving machinery.
High wages.
Large per capita wealth.

It is generally admitted that the schools should teach how people can become strong and healthy. It is proposed in this paper to point out reasons why economics should be taught in the high schools in order to give the student the ability to comprehend the relation of industry to national welfare.

Those peoples are best off that are able to command the greatest supply of the things that will satisfy human wants. A general distribution of the comforts of life among our population is the best guarantee that our institutions will endure. There is but one way in which the comforts of the masses may be increased. More wealth must be produced. No greater share of wealth can go to the laborer as long as it is not produced. No strike can secure to laborers more wages when the wealth from which the additional wages are to be paid has not been produced. The chief reason for the high wages that are now paid in the United States is the great productivity of the American laborer.

There are but two ways in which the wealth of a country can be continually increased. They are by the use of labor-saving machinery and by the discovery of greater economies in the organization of industry.

To illustrate the effects of labor-saving machinery on national welfare it is only necessary to show by countries the amount of ingenuity that is

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constantly employed in invention. Where great numbers of inventions are made annually it is evident that there people have learned the value of machinery in the production of wealth. Here is the table of patents issued in the various countries for the year 1899:

United States	650,123
England	276,129
Belgium	154,155
Germany	126,114
Austria	82,933
Italy	49,990
Spain	22,314

This table shows very clearly the immense superiority of the American mind in devising methods by which the forces of nature may be made to do work that in the old world is done by manual labor. Mulhall says, "An ordinary farm hand in the United States raises as much grain as three in England, four in France, five in Germany or six in Austria."

There is in every nation a fund of inventive genius that should be secured by the state. Inducements should be offered for the invention of labor-saving devices. Opportunities for the study of the needs of the nation along industrial lines should be offered in the public schools. No nation that fails to develop the inventive genius of its population can ever be able to compete successfully in the race for progress.

A good illustration of the effect of this neglect of a nation to secure the benefits of developing the inventive genius of its people by economic and industrial training is afforded by the history of the steam engine in England. When the imperfect engine was first brought out it was not considered a proper thing for the young men in the schools to study and endeavor to improve. The first engine was that invented by Newcomen about 1720 in which the piston was operated by atmospheric pressure. In the years succeeding 1720 there was great need for a machine to furnish power and especially after textile machinery had come into use. Few things could have yielded society a larger return than the early perfection of the engine. The great difficulty and the one that prevented its application to general industry was the manner in which the vertical motion of the piston was turned into rotary motion. The inventors could not transform vertical directly into rotary motion. They had seen pumps and water wheels and they saw that the piston moving up and down could be made to pump water. They saw that this water could be made to run from a pump spout onto a water wheel and cause it to turn. In this way they secured rotary motion. They knew that most of the power of the engine was lost by this method but they could not remedy the defect. The teachers of the world did not think the study of economic and industrial questions as important as that of belles-letters and for sixty years this awkard mechanism was the only one which enabled the engine to furnish rotary motion and in consequence it was not applied to industry in any very great degree. Not till 1780, years after Watt had invented an engine worked by the expansive force of steam was the simple crank invented by which the motion of the piston was changed directly to rotary motion. For sixty years there was this loss of energy due to the imperfections of a machine, which, had it at

once have been perfected, would have greatly increased the production of wealth and vastly contributed to human happiness and national strength.

If we keep in mind the purposes tor which education is instituted among peoples, we shall not fail to see that here was a time when humanity would have been a great gainer if there had been taught in the schools more of those subjects that are immediately concerned with things that affect us in our daily lives, and less of the more ornamental than useful subjects. Philosophy is not studied to the best advantage in a population that has not learned to secure at least cost the things that are needed for its comfort. The contemplation of this abstract science is carried on most successfully by those who are relieved from the pressure of subsistence. The Greek philosophers who gave us such sublime conceptions were men far removed from the thoughts of how to secure their daily bread.

From 1720 to 1780 the universities of Oxford and Cambridge were in a flourishing condition. There the favored young men of England were being sent to be turned into gentlemen. There they were spending their time pursuing with horses and hounds the trail of hare skin scented with anis-seed and engaging in such other sports as were thought proper for the best bloods of the country. Sport was the mark of the gentleman and the aristocracy. Education was not then carried on for the purpose of assisting industries by stimulating the invention of machinery. It was thought to be the business of the schools to make gentlemen. Such business as inventing and improving machinery was left to the children of the poor as were Watt, Crompton, Hargreaves, and Arkwright, to whom the doors of schools had been all but closed. It is true the necessary improvements in the engine were finally made. But it should not be forgotten that it took sixty years to invent a device that to us seems exceedingly simple.

The greatness of modern England is the result inventions in the manufacture of textiles, yet few of these epoch-making inventions in the industrial history of England have been the result of the labors of men that were favored with training in the English universities. Nearly all were made by men who enjoyed in but a limited degree the advantages of schooling. One, Hargreaves, was illiterate. By errors on the part of its educators the industrial greatness of the nation was made to depend not upon the results of the labors of those that had been trained in the schools but upon the labors of those that had been largely denied any education whatever. This explains why it took the English people sixty years to convert vertical into rotary motion. Had economic training in the schools made apparent to the people the value of labor-saving machinery in increasing the national welfare, these great inventions might have been made many years earlier.

It should not be assumed because the Americans are the most inventive people at the present time that they will always remain so. Because we are in the lead now is no reason why we should neglect economic and industrial training. European nations have discovered that we are their superiors in the matter of wealth production and have taken measures to correct their own weakness in this respect. Germany began the movement by establishing in the cities commercial and industrial schools in which young men are trained to invent new industrial processes and to improve upon those that are already in use. Of these schools, Saxony alone has 58 commercial, and 287 industrial institutions. Baden has such schools in nearly every city

and the same is true of the greater number of German states. A very large number of young men trained in these schools have come to England and are in charge of the correspondance of great houses where they receive large salaries. As soon as they have learned English thoroughly and also the best methods of their employers they go back to Germany and aid in the industrial advance of that country. Germany has in recent years become one of the keenest industrial competitors of England. The English view the matter with anxiety. They correctly attribute the industrial advance of Germany to the superior training in commercial and industrial pursuits that her young men are receiving by means of these schools. Such schools are now being opened in the United Kingdom. Last summer one was opened in London modeled upon that in Charlottenburg. The movement for this kind of education is spreading rapidly in Europe.

The effect of commercial education upon the strength and prosperity of a nation is well illustrated in Germany. Forty years ago Germans in great numbers were leaving the Fatherland to seek homes in distant parts of the world. These emigrants were largely men between 15 and 50 years of age, men in whom the productive capacity was greatest, on whom the nation must rely for strength in war and industry in peace. Yet so little did the German nation realize this and so undeveloped were its industries that it regarded this loss of its strength as a gain and actually did what it could to aid its citizens to emigrate in the hope that thereby population would be diminished and thus more opportunities be afforded for those who remained at home. But notwithstanding the emigration, population did not diminish. Then a new policy was introduced. Instead of assisting its population to go to other countries, Germany turned its attention to the stimulation of industries at home. Commercial and industrial schools were opened in all the leading cities. Many chambers of commerce offered prizes for the invention or discovery of new industrial processes. The result has been a magnificent development of industry. More opportunities have thus been created for German citizens at home. Emigration has greatly declined. In this way the national strength has increased enormously. Population has increased from 40,000,000 in 1870 to 59,000,000 in 1900, an increase of almost 50 per cent.

Wealth may be as much increased by the organization of industry as by the use of labor-saving machinery. When a nation uses machinery and manufactures in great establishments, there is constantly demanded a higher degree of managerial ability. Extending the market is of great importance and to open a foreign market requires ability of a very high order. In recent years advertising has almost become a science. The immense sums spent for this purpose have attracted great ability to this field. No subject in modern industry is deserving of more careful study than the relation of advertising to the cost of production. The ability to increase the market is second only to that which increases the amount of wealth produced by labor-saving machinery.

The demand for large capital in industry has lead to the corporation form of organization. By this method the stockholders liability is limited and the business is operated by a manager. The manager's problem is to make the business pay as high dividends as possible. To his attempts in this direction is to be traced much of the evil of present industry. Sweating

system, child labor, overworked employees, are the result of the modern industrial method. These are difficult problems and while in the high schools is none too soon for our young men and women to begin to study them.

Education should take into consideration the needs of the state. Instruction should be given in those subjects that will enable the population to increase the national wealth. In Switzerland it is of great practical value that everyone should be able to speak French, German, Italian, and English and therefore these languages are taught in the public schools. The prosperity and wealth of that country depend very largely upon the number of foreign visitors and ability to converse with them is of very material advantage to the inhabitants. The chief business of the country is entertaining tourists. Hence, languages must be taught. But while the tourist industry determines that languages shall be a part of the school curriculum in Switzerland there is not such a need in America. The chief business of this country is not entertaining tourists. It is producing wealth and extending our markets.

In a republic like the United States where economic problems are settled by the citizens at the ballot box, the school should familiarize the student with questions that will come before him. To omit to teach these subjects in the schools is sure to result in national weakness. He who has begun thinking about a question in his school days will be better prepared to find a solution when he reaches manhood. Among the problems that will have to be settled in the next fifty years are the following: Immigration, labor and capital, government railroad ownership or control, municipal street railways, old age pensions, postal savings banks, packet post, income tax and tax reform generally, control of the trusts, workingmen's insurance, pauperism and crime, and prison reform. These questions are now before us and in great degree our future welfare as a nation depends upon the kind of solution we are able to find for them. It surely seems unwise to omit in the schools teaching that is of so much usefulness. From the point of view of national welfare it is of greater importance that our citizens should have intelligent opinions on the subjects enumerated above than the ability to speak a dead language.

It is thus clear that to secure the greatest amount of national welfare the school system should follow a more definite plan than has hitherto been the case. General culture must in some degree be sacrificed to more special and useful ends. With the increase of democracy the school should be brought within reach of an ever increasing number of people and the subjects taught therein must be those that are most useful in our national life.

MATHEMATICS IN THE HIGH SCHOOL.

By CHARLES BURGER, Ph. B.

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With a major portion of high school graduates, formal education is a thin of the past. The special privileges of the institutions of higher learning ar reserved for the favored few. Consequently the general plan of a hig school curriculum should be such as will best prepare the student for lif for good citizenship; one that will make him a valuable factor in his con munity no matter what be his chosen vocation. Be it a printer, a bookkeepe a professor, a merchant, or an engineer give him a good training in the fund mentals and literature of his mother-tongue. Give him science enough s that he can walk with nature occasionally and think with her about he protective coloration, her dissemination of seeds. Teach him history, partic ularly that of his own country and times. Give him mathematics, at an rate enough to calculate with absolute accuracy how much is coming to him self and the other men. Is it too early to expect our boy to manifest a pref erence or show aptitude along some particular line? Experience says no Our high school curriculum then should contain electives so that each ca choose according to his ability; ancient and modern languages, typewriting drawing, manual training, and mathematics. The Technical School here breathes a sigh of relief. In spite of her continual cry of more mathematics she is only too well aware of the fact that Engineers have to deal with other things than physical laws and materials. They are looked upon as generally educated men. They must manage men and matters. They must have breadth of culture and genuineness of character.

Technical Education is not what it used to be. The number of students choosing this line of work is increasing rapidly. The opportunities and demands furnish the incentive. Some of the best thinkers and educators of today are counted in her faculties. A glance at the journals will convince one that we are well into a revolution in the methods of instruction and that the mathematics is suffering most. It is being twisted, torn to pieces, turned end for end, until it is scarcely a semblance of its former self. Nor is this revolution confined to the technical schools themselves. Preparatory and high schools are interested as well.

For a dozen or more years committees, selected from the best educators in our land, have given valuable time and study to the subject of entrance requirements in our technical schools. In the Proceedings of the Society for the Promotion of Engineering Education one may find page after page of tabulated material constituting the information gathered by communication with technical schools and their preparatory schools in regard to what the latter were doing by way of preparing students for the former and in regard to what the forme rwere expecting from the latter. One report embodies 89 responses from 110 Colleges of Engineering and 250 replies to circulars

sent to high and preparatory schools. Based on these reports three classifications of the colleges are made. Class A, comprising 3, of the just mentioned 89, and most of these are regarded today as out standard technical schools. Among them are Mass. Institute of Technology, Cornell, Columbia, Armour Institute, Case School of Applied Science, Stanford, Sheffield, Lawrence, Worcester Polytechnic Institute, the Technical departments of the Universities of Michigan, California, Wisconsin, and Minnesota. Their requirements in mathematics include at least Algebra through quaduatics, Plane and Solid Geometry or Plane Trigonometry. Of the thirty-one in this class, eighteen require Algebra through quadratics, ten Advanced Algebra and three Algebra Complete. These reports are based on the definitions as given in the recommendation of a committee appointed for that purpose by the N. E. A. Twenty-six of the thirty-one require all of Plane and Solid Geometry, nine require Plane Trigonometry, and two Spherical Trigonometry. The committee finally embodied in its recommendation the following requirements in Mathematics: Arthmetic Complete, Algebra through quadratics, and Advanced Algebra, Plane and Solid Geometry, and Plane Trigonometry. The communications with the secondary schools show that about two-thirds of them were teaching solid geometry and about one-third of them Trigonometry and it was difficult to sum up just what they were doing in Algebra. They were all giving at least one full year to this subject. The general trend of complaint among the high schools being that the colleges were going in two extremes, one class in holding requirements too high and the other too low. In the one case more was demanded than could be done with sufficient throughness and that this class was becoming too exclusive, removing itself too far from the masses, attracting a brilliant class of students by no means of that class from which experience shows our best engineers come. Students whose native talents are far above the average are essential factors in the success of any school and no effort should be spared to attract that class to the exclusion of all others. This cannot be done by raising the standard of admission because we then get those who have had the greatest opportunities rather than those of ambition and strength of character. The second class of colleges on the other hand hold the entrance requirements so low that boys are induced to enter before they are through with the high school course, thus either lowering the standard of Engineering graduates or holding up the standard at the expense of the students by plucking a large per cent before the end of the year.

The committee suggests that there is a strong undercurrent in the responses from the Colleges that finds expression in demands for greater breadth and mental grasp on the part of the applicants. The complaint being over the lack of Freshmen to **think** in mathematics. It strikes me that here we touch the keynote of the whole situation. Be our requirements what they may—say a mean between the two classes mentioned above. What we expect of the high schools is that the graduates who come recommended to us know and be prepared to use what mathematics has been taught them. There seems to be a woeful lack of intelligence or thoroughness along this line among the Freshmen. A large portion of our College Algebra time is required to drill upon work that should be given in the high school. What we need is the student who can use numbers rapidly and to carry numerical calculations, no matter how long, to accurate conclusions. The average stu-

dent lacks strength in this respect. He thinks that if he understands ho to solve a problem, that is sufficient, even if his result be inaccurate, ar that it is a waste of time to check and correct calculations. No greater mi take could be made. Not long since I had charge of a class of about six students who were individually taking observations on the sum and makir calculations for the determination of a true meridian. Although the Su veyor General requires that such work should check within three minut I had difficulty in convincing the majority of the class, whose errors wei not within the required limit, that now is the time to make it check. prevalent feeling being that "if the time ever comes when I have to do it can do it." This is a sample of what we find all along the line. A short tim ago a junior in Machine Design to whom had been assigned the task of d termining the size of a shaft that would do a certain amount of work r turned with a result of say seven inches instead of 3⅝, I cannot forget th look on the professor's face, and the remark that followed; "Its first class fo a Freshman but 'bum' for a Junior." The result above brings forcibly t mind another great weakness in the men as they come to us and that failing to observe the unreasonableness of results. A good habit is to tak a birds-eye look at the problem and form an estimate of what the resu ought to be before trying to solve the problem.

It seems imperative that a technical student have all of his mathematic equipment by the end of the Sophmore year. The work of a purely technic character that must be taken in the school requires that the mathematic be completed and ready for use by at least the beginning of the third yea During the Freshmen year his work is largely mathematics; Algebra, Plan and Spherical Trigonometry, Descriptive Geometry, Analytic Geometry, an the Elements of Calculus. Ten hours a week throughout the year. Durin the next year Calculus and Differential Equations require five hours per wee of his time in class.

I doubt whether a student who has no liking nor aptitude along math matical lines should ever attempt to do this work. In most cases it mean a failure. Of course there are exceptions, where the mathematical instin does not develop until late. Usually this student has cahracte and persistenc that will win in the end even though it take five or six years to complet the course. The above course of study is based upon entrance requiremen even lower than those recommended by the committee above referred t namely: Algebra through quadratics, Advancd Algebra, Plane and Soli Geometry, and Plane Trigonometry. The question then arises, do our hig schools prepare stulents to meet these requirements? Certainly many d but many are not doing it. This is not a local question either. Engineerin Colleges everywhere are asking the question, What's the matter with ou preparatory schools? The general complaint is not so much that studen have not had enough mathematics but rather because they cannot use wh they have had. I am inclined to feel that the main cause is due to overcrow ing, trying to make students do too much, too many presribed courses, ind viduality is not prominent enough, classes are too large, teachers have to much to do. There is too much of the "only to get through" spirit. Of cours I do not believe in holding back a student who cannot get mathematics bu I do believe that the teacher's or principal's statement that comes along wit

a student and his certificate should mean more than it does. It is a matter of business, a cold-bloded affair.

Is, our position then a fair one on the first topic—(1) Assuming a mean standard of requirements on our part (2) asking for the high schools a curriculum that will give a good broad foundation and apportunities to develop the students best powers, and (3) calling attention to the student's lack of ability to use his mathematics, unwillingness to attack tedious problems, over-confidence in his ability to do when the time requires it in spite of his inaccuracies now, examining the reasonableness of his results, and (4) overcrowding students, too large classes and a statement from the principal that is worth its face value.

As regards detail in mathematical teaching, too much emphasis cannot be given to accuracy, neatness, and arrangement in computation work. While I do not believe in assigning too much daily written work to be done at home and handed in yet an important part of the student's education is neglected if some of this in not done. A definite form for such work should be insisted upon and no slovenly work should be accepted. If such work is required I believe it should be corrected and returned. In line with this I have found a short written quizz of about ten minutes at the beginning of the hour on some portion of the day's lesson very effective in their daily preparation. I always correct, and return and explain the problem the next day.

I believe that the teacher's attention should be aimed at the average of the class. Neither the dullards nor the brilliant ones should monopolize his time. It is a very common fault that brilliant ones do monopolize reciting. There is nothing the students like better. They will sit with eyes and ears wide open. This is a very easy way to conduct a recitation. The danger is that too much of the knowledge goes in one ear and out of the other. Of course the amount of explanation demanded on the part of the teacher depends upon the subject. Student recitation is much more important in Geometry than in Algebra. The possibilities in logic, orginality, and English and not at the sacrifice o mathematics either, offer more resourcefulness in the one than in the other. Too much time is wasted in teaching Algebra. Too much working for answers. Too much mechanically reading off symbols by the yard and calling it explanation. I should say rather than send twenty-five pupils to the board, assigning to each a different example, assign one, then let the teacher pick a typical solution and explain that thoroughly, emphasizing errors that students are apt to make and calling attention to the various points of the lesson that the problem suggests. May I not here suggest that a school room for mathematics should have an abundance of blackboard space for all the students in the class. Lessons should be assigned with more care. Some of the best teachers I know come to class with the assignments and what they hope to accomplish during the hour written out, thus showing careful thought and preparation before coming to the recitation.

Professor Waldo, not long since president of the mathematical section of the Society for the Promotion of Engineering Education, writes that the time is past when mathematics is referred to by the thinkers of the day as being principally discipline. It is true of course that, rightly pursued, it is a discipline but it is far more, it is a knowledge, a power, a civilizer. Time was, and not long ago either, when mathematics beyond Trigonometry was

merely a mass of symbols to the average college man who had to take it, his Analytics a mass of formulae to be memorized and his Calculus a Chinese puzzle. Professor Waldo is one of our best educators in Technical mathematics and one of the enthusiastic exponents of the Perry Movement that seems to be stirring matters somewhat in many of our schools. One of Perry's latest disciples in our own country is Dr. E. H. Moore. It seems significant when such a man as Dr. Moore, head professor of mathematics in the Unversity of Chicago, whose home is in the Theory of Groups, should devote his time and energies in expounding and advocating the doctrines of the Perry movement.

Professor William Perry who holds the chair of Mathematics and Mechanics in the Royal College of Science, London, is certainly an enthusiast and has produced a profound impression by his papers on the teaching of mathematics. While some phases of this movement, at the present time, are extreme and impracticable, the substance of it is valuable and we shall be much benefitted by it. Professor Perry must be an excellent master but I believe that no one but himself could teach his Calculus.

Professor Waldo sums up Perry's ideals in Secondary Education, somewhat Americanizing them as follows:

(1) Emphasis should be placed on quality rather than on quantity.

(2) Thought shall precede form.

(3) Systematic and progressive problems based on everyday experience shall be, to a much greater extent the materials of education.

(4) That problems shall be largely concrete and worked out to accurate numerical results.

(5) That Arithmetic, Algebra, Geometry, and Trigonometry shall not be set off in water-tight compartments but that they shall develop side by side in the boy's mind.

(6) That the mastery of these subjects shall be the work of judgment rather than of memory.

In conclusion may I not quote a few extracts from a letter written by Professor Perry to Dr. Alderson. Their matter is pertinent to the subject at hand.

"I am very glad to think that American Teachers are open minded enough to be able to discuss my ideas. My ideas are mere truisms, mere copy-book maxims, known to every educationist, but never till now applied to mathematics. The great Cambridge Mathematicians are all my personal friends; they have done their very best to follow my ideas and they cannot. It is as if one asked a Mohamedan to take in certain Presbyterian ideas or as if one askel a Presbyterian to consider Shintoism rationally. The senior wranglers assure me, almost tearfully that they really cannot allow undergraduates to approach the doctrines of limits except during years of Orthodox Ceremonial. They seem to think it is only the orthodox mathematician who really knows what we mean by $\frac{ds}{dt}$ the speed of a body. I am afraid that I think that

everybody, every boy, knows that perectly well—unless indeed he has had the plain idea destroyed by a course of mathematics. Our mathematicians are spending their time now proving all sorts of things to be **doable** which the plain man knows to be **doable.** Which the plain man does without getting preliminary permission. I spent two weeks when I was young in proving that an arbitrary function can be expanded in Fourier Series. But after all perhaps this was good work. What I complain of is the carrying of this work into all our mathematical physics."

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CONTENTS.

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HALL ON GROWTH---PRECIS AND COMMENTS.*

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Professor of Philosophy.

I. GROWTH IN HEIGHT AND WEIGHT.

The curve of growth of the average individual in its various rises, pauses and declines, is a recapitulation of the stages in the evolution of man. This growth of the individual begins with the beginning of its prenatal life. The germ plasm itself is in a sense immortal, or mortal only inasmuch as the race itself may cease; but this immortal germ-plasm puts on mortality by assuming the life of the individual; givng its own life again in posterity. It is to this end that pleasure culminates in the relations leading to the propagation of the species.

This germ-cell once impregnated, grows and divides into two without separating; these divide similarly and growth thus proceeds in a sort of geometrical ratio. This rise in the growth curve repeats the history of evolution from the protozoan to the metozoan stage. The cellular theory needs to be supplemented by assuming powers that cannot be derived from the cells. And probably the original cause of racial evolution was no inherent and specific **nisus**, but was due to a struggle for survival necessitated by environment.

The embryo recapitulates a thousand racial years in a day, so to speak. Heredity tends to economize time by transmitting hard won experiences to the individual in condensed forms.

The growth of the ovum is expressed in enormous percentages. From impregnation to birth the curve is varied. Weight and length increase most in the first and third months. From impregnation to birth the weight increases some 905,600,000 fold. There is in these prenatal stages a fierce struggle among the cells for nutrition. Some attribute the cavities, folds and divisions of the body to the fortunes of this war. Muehlmann attributes all necrotizing processes to malnutrition. Weismann attributes death, (which differentiates uni-from multicellular organisms), to growth. He attributes the origin of the skeleton, muscles, nervous system, etc., to starvation occurring in this struggle, thus making diversity of function dependent upon distance from, and difficulty in, food supply.

At birth the child has about one-third of its adult length and one-twentieth of its adult weight. It increases in its first year 9 inches and 13 pounds, in its second year 5 inches and 4 or 5 pounds. At 2½ years it has half its adult height and one-fifth its adult weight. From this age to the prepubescent acceleration the growth is fairly regular. This acceleration occurs at 13—14 in boys, and two years earlier in girls. But the curve shows some acceleration around the seventh year and some retardation around the tenth. At eighteen there is decided retardation and increase of sickness. About a year or two

* The purpose of this review is to stimulate an interest in Hall's Adolescence.

later there is a final spurt of acceleration. Growth in height practically ceases in the early twenties. Twins grow less than single births. Boas finds that first-born children are larger, despite opposite views. [For tables and curves of growth, giving average height and weight of children for all ages, consult chapter I, especially page 7.] Most observers find the most rapid growth in height from 14 to 15. Growth curves vary for different nationalities. There is little scientific knowledge of growth of children under five, as yet, also of growth of those over twenty-three. There are many grave problems regarding scientific methods of measurement and of handling statistics. Boas is perhaps the best American authority. Many generalizations about growth have been made which have been based rather upon exceptional than typical groups. A type is a norm which every individual in a really homogeneous group tends to approach or to vary from, and in a pure race the average persons should be most frequent, and around them others should be grouped closely as well as symmetrically. Of course there are types for small groups or species as well as for races or genera.

The study of a single child or of a family, all of whose environment is known may have a greater value than a great mass of measurements where the environment is vague or ignored. But it is remarkable that whether individuals or large groups are studied, the main characteristics of the curves of height and weight remain the same. So that we may say there is agreement among scientists regarding (1) Prepubescent acceleration; (2) Precedence in this of girls by a year or two; (3) Slight depression from 8 or 9 to 10 or 11; (4) Gradual tapering off in height-growth after 18 or 19; and of weight-growth a little later; and (5) Slight depression on entering school with acceleration shortly after.

Many interesting conclusions have been reached by different scientists concerning special points relating to the height and weight of children. Bowditch finds that girls under 58 inches are lighter than boys, over 58 inches heavier (for a while); also that large children reach the pubescent increase earlier than small; also that at eleven boys and girls grow very little. The Milwaukee studies find boys taller till the twelfth and heavier till the thirteenth year. Girls are taller and heavier than boys from thirteen to fifteen, but shorter and lighter afterwards; and girls almost cease to grow at 17.

Most agree that girls are taller than boys from 11 to 14 or even 16. They certainly have a period of very rapid growth and it comes earlier than that of boys. The remarkable burst of growth at puberty seems marked in savages also, and even in lower animals. It is suggested that there is something analogous even in the vegetable kingdom.

Of all single measurements, that of height is the most valuable and instructive regarding the individual health and general development. Height and horizontal dimensions increase independently, perhaps conversely.

Weight-measurements are valuable, but weight increase often goes with decay of important tissues and increase of fat and water; height is, roughly speaking, never lost, while weight is very variable. Increase of height without symmetry and proportion, however, is not always a gain. Insurance companies discriminate against tall slender men. Weight increases most from August to December, height from March to August. Boys grow thick most slowly when they grow tall fastest, and vice versa. Local temperature must be considered when such dates are concerned; but the general rule is that children grow

tall in the spring and thick in the fall. Possibly children can be developed in height or weight by change of residence corresponding to these laws. Adults probably grow thin when children grow tall. Children eat most from December, reaching a maximum in March.

Pauses of growth in height and weight may be periods of progress in inner adjustments and are not to be regarded as marks of weakness; during such pauses new-grown cells, tissues and organs may be achieving harmonious interaction and compensation. When growth at any period is unnaturally slow because of hard conditions it may be compensated for later by rapid increase at unexpected periods. But perhaps growth is most advantageous when most normal in time. The age of entire cessation of height-growth is very variously estimated and cannot yet be determined.

Beyer finds from observing cadets at Annapolis that heavy boys respond best to gymnastic exercises, but short boys continue to grow later. Some college reports find, however, that large boys grow later than small. Hitchcock (Amherst) reports growth of one-tenth of an inch at 26th year. Sargent (Harvard) thinks men grow in height to 23 and in weight to 50; weight added after 25 is either abnormal or stores carbon for age. Persons taking least exercise grow least, but those taking most do not grow most. All such questions can be answered only with a great increase of scientific data.

No doubt new methods and refinements of measurements of food, chemical products, excreta, etc., will make the chapter on growth more instructive. But it will be difficult to learn the really important matters of intracorporeal growth such as weight of tissues, organs, etc. Growth is essentially the formation of new cells from granules, or increase in size of cells. Other factors that seem true growth are errors to be eliminated. Gain and loss on the higher planes of physiological life are the real quest and it is baffling. Studies of fatigue and all we know of metabolism emphasize this view.

Stature is thought to be fundamentally determined by race. Women approximate men more closely among savages. Voluntary emigrants, some think, are taller than "stay-at-homes." Longheaded races are taller than broadheaded, are more energetic and civilized. Most human beings are between 5 feet and 5 feet 10 when adult; lower animals vary far more from the average. Bowditch finds American college boys larger than English. City life decreases stature. Pinkham finds that when Germans and Americans intermarry the children incline to be as tall as the taller parent. Retardation by poverty is marked in England and Italy and slight in the United States. Children of well-to-do parents are taller and heavier than of the very poor. [Tall and heavy people are more successful, successful people have tall heavy children. It is difficult to say what part food plays.] It seems that better food supply is favorable to growth.

The effects of climate and temperature upon growth require further research; it is difficult to isolate this problem from those of work, food and rest.

There are many optimists who think that with better methods of living and training the race will become much larger. It seems highly improbable that any marked change in the average height is to be looked for in a brief period. Besides we cannot assume offhand that great height would be advantageous, [especially in an age in which superiority of muscle and bone is of less advantage than superiority of nervous functioning.]

Would it be better if the growth curve were a straight line? Possibly it is since we measure only the height and weight while knowing little of inner growths.

Is the utmost possible growth desirable? Are large children superior in reality or only because others look up to them and thus develop their powers and confidence? But some have found that the large children are not the brightest. The facts are not sufficiently known. Galton finds tall men less fertile than short.

Giants are quite generally defective in some degree. It is not demonstrated that the largest brain is superior. Many military men prefer small or average-sized recruits. Beyer thinks average size the goal to strive for. It would seem as if the leaders of the race were on the whole large men and if so progress must mean increased size. [Unless this fact results from a prejudice based upon earlier warlike conditions. Of two men equally endowed in every other respect, the larger would be chosen in most of the professional careers; yet the reason for this is surely a relic of an age when military prowess was the chief test.] Genesis and individuation are beyond a certain point in inverse ratio to each other; giants and monsters among men and animals have low generative activity.

Having now dealt with the facts concerning growth and size, let us consider their significance for psychogenetic educational theories. What explanation can be offered for the almost universal retardation of growth just preceding the pubescent outburst of the great increment in the earlier teens? No one has seriously attempted to explain why girls undergo this maximal growth earlier than boys. One suggests that it is accidental, another that nature intended the female with her larger functions to be larger than the male. But it is an almost general law of nature that she is not so large, so that no facts concerning man's conduct would explain it. Yet this wave in the growth-curve is a fact and calls for explanation. An at least hypothetical explanation is the following: If man developed from animal to savage it seems probable from what we know of primitive races, phallicism, etc., that the female would at first be prematurely impregnated, at least as soon as she became attractive, on account of the hypertrophied sex passion in the human male and would be forced to assume maternal functions before nature had completed her preparations therefor. As the institutions of a dawning human civilization made their claims fertilization would be postponed. Thus the cell-development corresponding to early stimulation of reproductive function might be turned to use in somatic growth. Male restraint and female coyness would thus turn the aroused vitality to improve the size of the female. Natural selection again would favour the larger female in this new civilization since those females who could in an age of violence best protect themselves against male aggression would survive and transmit their greater muscular development on account of the advantages of deferred maternity.

But indeed have not all advances in somatic growth and individuation arisen from the suppression of successive modes of reproduction, and are not all the rises of the growth curve just the ontogenetic correspondents of ancient phyletic advances in which postponements of reproduction have led to outburst of somatic development. Many of these must be older than sex itself. When the individual passes some stage in which the race once felt a profound reproductive stimulus which it later suppressed as it advanced to

phyletic maturity, then the individual tingles in every cell with an energy which lifts it to new phases of growth and function. So much for the sudden acceleration, but now what has recapitulation to say of the long plateau of rest which occurs between 8 or 9 and 10 or 11? This period of retardation represents not a pause before a leap, but a time of balance between the fundamental growth of large bones and muscles and accessory development of small and more peripheral parts and functions. The boy at this age is well adapted to his environment and in a suitable climate could live very well independently of parents, maintaining himself like a young animal. This phase of the individual corresponds perhaps to some long post-simian, pigmoid period in which the race rested in a stable and secure relation to the world, a sort of Eden in which its well-balanced functions provided for it and defended it with great satisfaction to itself. Truants, criminals, cow-boys, et al. show a tendency to revert to this happy life.

Many influences led to the suppression of this low plane and to a new transition to larger size. (1) Natural selection gives best food and wives to the largest. (2) Migration to vigorous climates selects the larger. (3) Struggles against wild beasts select the stronger and larger. (4) The advent of the father in family relations perhaps favoured development. And (5) as adolescence favours "sports" because of the general instability of the organism, larger types may have been developed accidentally when once conditions were altered by the causes given above.

The new man developed by this preadolescent increment is a real superman as compared with his ancestors.

Boys of 10 lead a life with and for each other and regard adults as strange and unreal beings of a different order. Of course we cannot as yet prove that the race ever was like what boys of 10 now are, but we have already shown that the horse was once phyletically the size of a rabbit, then of a fox, then of a sheep, then of an ass, etc. But the relative size and age of the time of reproduction must have been a factor in the size of man; and we can look for light on the whole question of man's evolution, not only in the growth of his body, but in the facts of his psychic development which reveal so much concerning his remote relations to nature.

If we believe that educational theory must consider man in relation to his whole environment we must study him in relation to his previous advance and believe that he is still in the making. Assuming the bionomic law, infant growth means being loaded with paleoatavistic qualities in a manner more conformable to Weismannism, (embryonic growth even more so) while the pubescent increment is relatively neoatavistic. If so the older the parents when reproduction occurs, the less stable the characters transmitted to their children, and hence the less rigid the instincts inherited and the greater the possibility of free development.

Thus the adolescent stage which corresponds to the most mature stage of reproduction is the bond of promise for an education that puts its faith in the possibility of controlling the evolution of man on his way to a higher plateau of life.

II. GROWTH OF PARTS AND ORGANS DURING ADOLESCENCE.

We now pass to weigh and measure single parts and organs. These measurements must often be made on the cadavers. The data are meager for final generalizations.

The parts do not grow in equal ratio. If they did so the infant wo become a monster adult, with an enormous head, with legs and arms too sh the body too thick, the trunk too long. Vierordt's table of relative growtl parts is the best on the whole. [See page 51.] The muscles grow from b to maturity 48 fold, skeleton 26, lungs 20, stomach and alimentary canal liver, heart, kidneys and skin 12 to 13, brain 3.7, eye 1.7. The body a whole grows about 20 fold. Many rudimentary parts (Wiedersheim descri several score) decline and even vanish. Prenatal growth shows similar, greater, changes of proportion in parts. (Teratology is a science which de with abnormal growth and decline of parts.) These changes in propor are found not only in internal dimensions, but to a less extent in exter such as length of arm, hand, foot, breadth of head, shoulders, hips, etc. [table page 52.]

Hastings' **Manual for Physical Measurements** (the best of its ki concludes that the nearer an individual approaches mean development height the more nearly will he conform to an absolute standard of symme in his entire development.

Few parts grow steadily in the same person, and the variations a great for different parts of the same person. Persons who grow quite simila in general measurements, (of height and weight) may grow quite differen in parts and organs. The brain virtually stops growth before puberty wh the hips, muscles and many organs grow at an augmented rate. Puber growth is very general, yet even its energies focus upon certain parts, and t development of parts shows a certain sequence in spite of general simil ity. Psychic development in this respect is analogous and the study of the sequences is vastly important to scientific pedagogy.

Different parts have their growth, maturity and old age independent The kidneys are at their largest in the twenties, the muscles, intestines, sk eton and liver in the forties, the heart and lungs in the seventies, accordi to some writers. The order of development of the organs of the individu does not always follow the order of their phyletic development in spite of tl great basal law of recapitulation. [For an account of the views of this i exact parallelism see page 56.] In the present state of the debate betwee preformation and epigenesis we may, perhaps, assume that Weismannis holds rather for the earlier stages of life and the views of Hertwig for tl later. All that we need to assume is that there are neoatavistic factors ar that the later part of each individual life is more characterized by the evol tion of acquired characters. The discussion as to whether all physical qual ties are predetermined and the only chance of altering the inheritance through the dropping out of some modes of reaction which follow the develo ment of others, on the one hand, or on the other, whether there are reall some congenital indefiniteness, and some latent energies to be stimulated c set going, is somewhat like the discussion of innate ideas by Locke, both i the paradox and its solution. The instability of later stages may be prede termined, but the instability itself is the fact which most concerns us; and thi instability manifestly corresponds not to the earlier, but to the later stage of individual and phyletic development.

(A) **IN BONE-GROWTH** the axial system appears first in vertebrate both onto- and phylo-genetically, (first prenatal month.) Limbs gradually ap pear much later and smaller bones last. Early and fundamental bones appea

first and are less liable to defect and malformation; confirming the view that paleotavistic stages are surer and more stable than neoatavistic. There are exceptions, however.

Around puberty, bones grow much and knit. The 223 bones and 316 muscles make .726 of the adult weight. The skeleton weighs 13 per cent of the body at birth, 23 per cent at maturity, and declines absolutely and relatively later.

The ratio of sitting height and standing height has aroused much interest and some have thought the ratio varied regularly for each period of life.

The position of the centre of gravity of the body varies in its relation to the parts; as does also the point of bisection of the height. Moon thinks the legs are proportionately longer at 15 than at 11 or in manhood. Bowditch thinks women longer-bodied than men. Some dispute this. Perhaps long-bodied women are better mothers, and long-limbed decadent. [See pages 61-65.]

Arms, Legs, Thorax and Pelvis. The limbs develop before the pelvis and pectoral girdles, which support them, whether the pubertal increment is analagous to this order is not yet certain. The span between the tips of the longest fingers is slightly less for most ages than the body length. The shinbone is often bent back near its upper end and its joint surface inclined and enlarged; this is attributed to primitive squatting before chairs were used. The relative height of the knee varies during periods of active growth. The leg grows fastest in the upper thigh. At birth the foot is oblique so that only the outer edges touch the floor. The scapula, clavicle and upper ribs are phylogenetically sinking, owing perhaps to the upright position; cervical ribs are becoming abnormal instances and the upper rib is beginning to degenerate. Even the eleventh and twelfth ribs are becoming rudimentary. The thorax has flattened from front to back and broadened laterally as man has become erect. This change is marked from infancy to maturity. Chest measurement increases little from 10 to 12, at a maximum at 15, and continues marked till 19. Infants have the deepest chests. Girth of chest is usually about equal to sitting height in early teens. The pelvic girdle is slowly creeping up the spine as the centre of gravity tends downwards. The pelvic region, especially in girls, undergoes marked pubertal changes. Complete pelvic development is rarely attained till well in the twenties in women. The sexes seem to be growing unlike in this. [pages 65-71.] **Growth of the head.** The growth of the face is full of suggestion. Fishes and even birds have little expression. Ear movements are expressions of inner life in many animals. In others tail movements, salivary and other excretions. In the higher stages brain, jaws and nose develop. Heart rate and respiration show psychic states very significantly. The pupils and the voice are delicate expressions of the soul. Blushing, posture of head, mobility of nostril and forehead and mouth, suggest a new and fuller physiognomy.

Many measurements of the skull and its growth nave been made without leading to very valuable generalizations. The length of the face varies in growth at different periods. Head form is relatively uninfluenced by climate and food. The best head-measurements are concerned with relation between length and breadth. The early Europeans were long-headed. The broad heads came from Asia. The mixing of these led to a ferment in civilization. Americans are very mixed. The air cells in the temporal bones are not developed

until near puberty. Sargent finds the mean girth of the head in girls from 13 to 16 is only 1-5 inch below that of boys. West finds boys always superior to girls in length of head, relative increase being greatest from 18 to 20.

In apes and lower races of men the sutures of the skull unite first in the frontal, then in the parietal and last in the occipital region, while in civilized man this order is reversed. Whether this is atavistic or developmental is uncertain. Galton finds that honor students develop head growth earlier than pass men. The volume of brain may be 20 per cent less than skull capacity; but in growing periods the correspondence is probably close and as the brain is erethic, growth of skull probably is related to brain growth and activity. Up to a certain point in evolution, jaws, teeth and related muscles make for survival, but are later superseded by brain power. The course of dentition is very suggestive. [See Welker's table page 77.] Strong development of these parts of the face ought in general to indicate strength of animal propensities. The lower jaw in man is heavier between 20 and 45 than later. There have been some studies concerning the growth of the nasion, nose and upper jaw at puberty. Some find a marked increase in volume of neck at puberty.

Abnormalities of Bone Growth. Bones develop later than soft parts and are dominated by them. Bones are composed of cells, penetrated by nerves and blood vessels, are very plastic to normal forces of growth and external influences, and are subject to many diseases.

Ossification may be too great in parts, and mineralization encroach on cartilages, arteries, heart, muscles, etc. Joints may become rigid. Growth of skeleton may be deferred or insufficient. Bone cells may be broken up and discharged by suppurative processes. Bones may be perverse in form, proportion or chemical composition. . In rickets the skeleton grows into many irregular shapes owing in part to abnormally compensated muscle tonus.

Bones may be too brittle or too flexible. Also well marked types of micro-organisms invade them.

Excessive bone growth leads to growing pains. There is an intimate relation between sex organs and bones. [Page 81.]

The bones respond at puberty to tensions and attitudes. Right sitting and standing are important. Bone growth needs lime and the chemical constituency of water is important at this age. [page 83.]

(B) **GROWTH OF MUSCLES.** There is a wide field of individual variations in the muscles of the human body. These are more frequent in limbs than in body, in arms than in legs, in hands than in arms, suggesting that man breeds truer in the fundamental than in the accessory parts, which are less indispensable to life. 18,682 grams of muscle out of a total of 30,574 are connected with the legs. At 8 the muscles weigh 27.2 per cent of the body: at 15 32.6; at 16 44.2; at 26 45. After forty-five years of age they fall off rapidly.

Probably the most disproportion in muscular development arises from the fact that the larger and more fundamental muscles, which move the greater joints precede in their development the smaller, finer or more accessory muscles, which move fingers, throat, lips and make all the more delicate adjustments. This alone with the disproportion between bone and muscle growth is one of the chief causes of adolescent clumsiness.

(C) **GROWTH OF THE HEART AND BLOOD VESSELS.** The heart, which seems to be phylogenetically a remnant of the primitive body cavity aris-

ing in vertebrates as a fissure in the mesoderm, begins its development in the embryo independently of the arteries and veins, and soon joins them, but not until after it has begun to beat. From origin to maturity, the circulatory elements are probably the most variable of the great anatomical system, not excepting the muscles. Blood vessels vary greatly in different persons and repeat animal variations.

Circulation variability is most marked in parts connected with reproductive functions. The mature heart is 1-150 to 1-170 of body weight and as large as the closed fist. [For table of growth see page 90.]

After puberty hypertrophy is almost twice as common in males, and atrophy predominates in females. The hypertrophy is compensated in normal cases.

Rate of heart beat at puberty varies greatly. The heart often grows by leaps, 1-4 in a year even. Frequency is reduced at adolescence. From 8—12 for males and females respectively, it is 79 and 92; 14—21 it is 76 and 82; 21—28 it is 73 and 80. [See page 91.]

Increase of height corresponds closely to diminution of pulse.

Change in size and power of heart varies because of varying relation to growth of large arteries; this accounts for many disturbing cardiac symptoms.

Arteries grow in size till 60 at least.

Before puberty blood vessels are large and heart small. Later the cross section of the arterial system as a whole is small in relation to size of heart. (At birth 25:20, dawn of puberty 140:50, maturity 290:61.) There is a great increase of blood pressure at puberty. This leads to need of excitement. There is also a rise of temperature. There is a relative increase in weight of blood and power of producing it. [See pages 95-96 for further facts.]

(D) GROWTH OF THE LUNGS. Lungs and chest develop rapidly in adolescence. The lungs grow until old age. The best students in early adolescence show greatest powers of exhalation. Vital or lung capacity increases most at 16; and is greater than mere chest measurement. [For comparison of boys and girls see pages 100-101.] Running has been known to increase chest capacity over 300 cubic meters in three months. [This may not mean a corresponding gain in general health and strength.]

The ratio of lung capacity to weight is called the vital index. Deep breathing from whatever cause seems favourable to this index. Certain erect positions seem unfavourable to action of diaphragm. Frequency of respiration varies with size, (rhinoceros 6, rat 210). [See page 103.] Oxygen is the most immediate imperative need of all creatures that breathe. The psychosis of fears connected with narrow and close places is connected with this. The female organism needs less air than the male. Abdominal and costal breathing characterize males and females. Tight lacing is a factor in differences here.

(E) GROWTH OF BRAIN. Brain growth is nearly complete by the sixth year. It may increase to 65 or decrease after 55 in different individuals. The brain fills the skull more completely in women and children than in adult men. The skull grows till 20 and is no sure index of brain weight. The cord grows twice as much between infancy and manhood as the brain. But while the brain grows little in weight after puberty, its structure may improve indefinitely by development of cells out of granules.

The infant is born with few brain cells medullated; it is a spinal creature. The centres of its various sense activities are gradually medullated,

smell first and hearing last. Some think there are three levels of development (1) the gray cells of the pons, medulla and cord; (2) the mid-level or basal ganglia, centers for special sense and central convolutions of cortex; (3) higher two-thirds of brain, front and back. The lowest level corresponds to presentation, the middle to representation, the highest to re-representation, to use the old Scotch notation. Modern neurology confirms these views remarkably, thus giving a scientific basis for adolescent development. Adolescence thus seems to correspond to the stratum of tangential fibres of Vulpius and to Flechsig's two-thirds of the brain that lacks connection with the projection system, and to Jackson's highest level. Certain types of insanity are rare before puberty, because the child cannot reason according to adult standards until fourteen, the age at which Aristotle would begin the education of reason. Before this come (1) the age of reflexes and automatic nascency of late prenatal life and early infant months; (2) the age of controlled muscular actions, walking, plays,—when drill, habituation, memory, and instinct, culminate; and (3) the age of rational thought, higher logical correlation, personal opinion and conviction, higher aesthetic enjoyments, deliberate choice, and willed actions. The full development of each of the higher levels demands the full development of that below. Fundamental structures must precede accessory, logical methods must follow reflex and instinctive developments.

Gymnastic and motor and sense education are only the foundation of rational education. The dawn of this highest life is seen in day-dreams, grasp of large ideas in a crude form, and weak crude independent reasoning. Later these dominate life and in abnormal cases arrest the life of lower levels. [See page 112.]

(F) GROWTH OF SKIN AND INTERNAL TRACT. There is a rapid decline in the relation of surface to weight between birth and maturity estimated at from 812 to 301 centimeters square to one kilogram. The epidermis grows till 60.

As the skin covers the body from without, the mucous surface lines it within. Owing to its very many folds and the contraction and expansion of the intestines, its area can be determined with even less accuracy than that of the skin. The total length of the digestive canal is about five times that of the body in the adult; at birth it is about six times. Its surface is about equal to the surface of the body in the adult. [Pages 113-114.]

We shall never understand many of the deepest problems involving the relation of the mind to the body until we can write a new chapter of psycho-physiology on glandular psychology. Secretions and excretions, both internal and external, condition many psychic states in a way hardly less basic than they do all other physiological processes, and for fundamental feelings and instincts they are probably quite as important as the brain itself.

The kidneys grow well into the third decennium. During most of the life of the individual, the kidney cells simply replace their slight loss without growing and after thirty usually begin to atrophy. One of the most interesting and important studies of physiology and medicine deals with urea. [Page 115-116.] Fears concerning health connected with kidney disturbances are almost universal, but quite generally groundless.

The liver grows slowly after 15. It atrophies easily, because of its mechanism of circulation.

The salivary glands increase in size and function in adolescence. Adolescents often "spit with various artistic refinements." The pancreas and spleen show great adolescent outburst of growth. The use of the spleen is mysterious. The growth of function in the sebaceous glands is significant for adolescence. [Page 120.]

A man loses about as much sweat as urine and these sources of outflow are complemental. Sweat is also a heat regulator. Both increase at puberty.

Hair and eyes change color somewhat. [Page 121.] Weeping is more frequent in girls after puberty than before. Ovaries and testes grow very rapidly.

The thymus gland often vanishes between 25 and 30. The thyroid gland diminishes greatly in relation to body weight. It has a great importance in relation to blood and nutrition, which is, however, not understood. [Page 122.]

Fat seems to decrease at puberty in vigorous boys; they become scrawny and angular.

The relation of the surface of the body to its mass in the adult is about ⅜ of what it is at birth, which fact causes a great variation in the relative loss of heat. Body heat may vary normally in the individual from time to time by 10 deg. F. It falls to a minimum about the fiftieth year.

In conclusion it must be said that anthropometry gives a different view of the ideal proportions of the parts of the human body from that of art. The modern head is larger than that of Greek sculpture. Modern students show an average type quite repellant. Individuality is the modern ideal rather than symmetry.

The bilateral halves of the body differ in size, strength, rapidity and temperature. Asymmetry increases at adolescence. Some find that abnormalities are greatest at 8 to 9 and decrease at puberty. Pupils of low rank show most abnormalities. Girls are less often abnormal than boys, but if defective are more influenced by environment. Disordered nerve states seem to go with defective bodily structure. Again it is a disadvantage to be tall broad and heavy if the lungs, heart and stomach are weak, because the greater strain brings collapse. [Page 127.]

We may conclude that the coming of sexual maturity involves changed relations of parts which for a time lessens their coordination and unity.

Puberty is like a new birth when the lines of development take new directions, some functions getting much greater importance, some diminishing. There is great increase of plasticity and docility, so that powers of acquisition are increased and deepened. The influence of environment is probably greatest at this period in producing acquired traits transmissible by heredity, although the influence of experience upon the germplasm may be greatest a little later. Changes of ethnic development best occur now. If the soul grows with every part of the body, if its growth also is discontinuous, irregular, and affects isolated parts, this is the age for modifying the race, and more can be done in adolescence than in the more stable earlier years or in any later years.

It is the age of reconstruction, the age when abnormalities can be overcome, the age at which science can take in hand the formation of man into a symmetrical being, by educating the weakest parts up to harmony with the rest.

III. GROWTH OF MOTOR POWER AND FUNCTIONS.

Muscles are in the most intimate and peculiar sense, the or-

gans of the will. The exhaustive study of one of the numerous muscles of a frog's leg opens up new views of not only anatomy and physiology, but even chemistry, mechanics, biology, education and philosophy itself. A man is what he does, not merely what he thinks, feels, or says, and what he does he does by muscular activity. We could form no conception of force or energy in the world, but for our own muscular effort, and the anthropomorphism of force is best understood by a realization of the part that muscular functions play in our mental life. So deep are these background functions, when concerned with race habits or instincts that they offer a sort of organic basis for our belief in absolute and necessary ideas.

In the foregoing chapters we have seen how the body grows at the dawn of sexual maturity; in this chapter we shall study the remarkable outburst of motor-power and function at the same period of life. The data here, drawn from gymnasium and other tests are abundant, but not available for satisfactory scientific generalization. Tables giving average increase of the power to lift weights give us general data for estimating increased strength, of back, legs, hips, arms, hands. [Pages 132-138.]

As far as any inferences can be based upon these not entirely harmonious data, it appears that lifting power increases on the average fastest at sixteen, but hardly less rapidly at fifteen and seventeen, and reaches a maximum at 23 or 24, with a decline in the rate of augmentation in the later teens. Biceps power also increases fastest at 15 or 16, and power to pull the weight of the body up increases fastest a little later, from seventeen to eighteen, power in forearm having its fastest increment later than biceps, and dip later than pull, as power of the arms to pull apart comes later than the power to press together. Wrist power augments very fast, about doubling from 6 to 10, and nearly doubles again from 14 to 17, pull up, dip, and forearm reaching a maximum about 23, or soon after. If Moor can be relied on, there is an almost explosive growth of leg power from 13 to 15, and the Amherst records suggest another marked augmentation at 18. All these directions of growth, perhaps especially that of leg-power, seem not constant, but in periods of augmentation and diminution. Leg-power seems to come first, then biceps and back, with forearm and power to repel later, and 23 is suggested as a culminating age. These influences, however, are insecure. How this almost fulminating growth of leg and biceps power is related to phyletic flight, pursuit, modes of conflict or sexual selection and fighting for the female, is a suggestive, but tantalizing problem, at present unsolvable.

The rapid growth of locomotive organs suggests early migrations and its selective advantages are conceivably manifold, and leg-power is, as we shall see, very closely connected with sex. If sedentary life tends now to arrest its normal later development, its nascent period should be more utilized. At this age the power of lifting the body by the hands falls off and this suggests a ceasing tree life. At this time also there is a sudden increase in the biceps which may correspond with a phyletic beginning of manual labor. These conjectures may yet take on the dignity of a real working hypothesis.

The power of the hand to grip or squeeze is a significant measurement. The infant grasps by pressing the fingers against the whole palm. The opposition of the thumb comes later and develops most rapidly in the teens. All tests, however various in other respects, agree in this result.

Erismann sums up by saying that in general the most rapid development of physical power occurs between the ages of 15 and 19. From 19 on the increase is slower and 26 seems to be a stationary period. The maximum of greatest possible development of energy occurs from 24 to 35, the maximum of lifting power comes a little later than that of the power to squeeze with the hands and also lasts longer. After 35 there is a gradual decline, which should not be marked before fifty. Although there is a remarkable coincidence between growth in weight and the pressure-power oı the hands, this parallelism is somewhat disturbed after 18, pressure power growing fastest, while from 14 to 18 weight increases fastest.

In general we can say that boys almost double their 11 year old strength of dynamometer grip by the time they are 16. This is nearly the case with girls. Neither will ever double again, but boys will more than treble their 11 year old strength and girls will not.

Kline concluded that the available power of a sudden squeeze is in proportion to the habitual vigour and energy of mental power and activity. Civilized man excels the savage in this.

The development of grip about 15 is great, but probably not suggestive. of tree-life as it is in infancy.

The development of control of the finer accessory muscles is determined in part by counting the number of taps that can be made in a given brief time-interval. Further tests are greatly needed for children and adults. How rapidly two like simple volitional contractions can follow each other is perhaps the best index we have of will time, and it not much behind the rate of most rapid clear articulation of successive syllables. The maximal adult rate of wagging the force-finger does not vary much from that of trotting the leg, whispering the sounds t and k, vibrating the head or lower jaw, but none of them have been tested for children. Bryan has made the best determination of maximal tapping rate at different ages.

Puberty marks the chief stage of nascency for increased rates of this finger movement, an important point for hand-training. But before puberty there is rapid increase in hand development and some interpret this as corresponding to ancient racial development in paddling, scratching, dipping etc., which seems as reasonable as relating the facts of infant grasping to arboreal activities.

The preceding kinds of muscular action require little thought or will. Accuracy of movement is very different. Many devices have been used for testing muscular control. For example the ataxiagraph indicates involuntary swaying of the body when standing, by a pen attached to the head, which writes on a plate above. Children in normal health are found to lack coordination and control almost as much as ataxic, choreic and paralytic patients. Control improves rapidly with practice. Delicacy of touch and eye are connected with precision of movement. Discrimination of weights reaches its maximum accuracy at 14 for boys. But in general, Bryan thinks that accuracy improves fastest for a few years after the age of six, and this indicates that at puberty large coarse forms of development are best.

A comparison in strength of the right and left hands shows marked difference at puberty. The brighter the pupil (Chicago reports) the greater the unidexterity, both in taps and strength. (Accuracy, however, does not follow the same law as strength: Page 149.)

In general nature does not favor very symmetrically developed types, and adolescence involves a marked increase of disparity in the dual halves of the body.

It is not yet clear how fatigue affects young adolescents; their efforts often seem great but spotty; they are erratic rather than plodding. The extremes of strength and weakness shown by students of upper grades is very much more marked than by those of lower grades. After puberty, children differ far more from one another.

The study of "second wind" is an interesting phase of the study of adolescent fatigue. In study as well as athletics the best work is done by those who go on after the first exhaustion point. Great fatigue seems necessary to development of latent powers.

The study of reaction-time has revealed some laws of practice and habit.

All muscles must be studied in the light of the grave distinction between fundamental and accessory muscles. The former are large, and function in large and general ways; the latter are small and fine, and function in more delicate movements such as the technique of music and the delicate arts. The former, such as those muscles used in walking are controlled by reflexes, the latter rather by higher conscious levels. The many automatisms and "tics" of children commonly affect the accessory muscles. In general paralysis fine language centres and hand control disappear first; the fundamental movements disappear before death. The difference between the human hand and the fore-foot of the lower animal illustrates the growth of accessory muscles and controls.

When we watch an infant learning to creep and walk we see something analogous to the assumption by primitive man of the erect attitude. At first the child wiggles along with its body; later the hip muscles come into play, later the leg becomes useful, and the toes, formerly flexible, become limited in action, while the thumb improves. The shoulder blades are at first somewhat parallel in children and later flatten back as the abdomen rests on the pelvis instead of depending from the back.

The number and delicacy of muscle-movements is in general the index of advancement in the scale of evolution. The delicate movements of face and hand in cultured classes as compared with the rigid brows and finger movements of day-laborers indicate profound differences of mental power. But unless the larger muscles are developed as well as the finer, the advance is not sound and stable but uncertain and superficial. Children must not be trained in fine movements to the neglect of fundamental movements. Precocity is from this side the expense of too much energy upon delicate adjustments to the neglect of basal and massive muscle work. The best cure for fidgets and choreic states is activity of fundamental muscles.

Children make an amazing number of movements. Lindley studied 897 common motor automatisms in children. Such odd tricks are called to mind by a few common examples such as, grinding the teeth, twirling a lock of hair, nodding the head, squinting or winking, moving the tongue.

These non-volitional movements so rich in number and variety offer a field of the greatest scientific interest. They are to be regarded in general as rudimentary impulses to do acts which in some pre-human stage were of all-conditioning importance for life. They are vestigial. They do

not anticipate future useful activities, as Groos thinks, but are relics of obsolete utilities. They represent, however, possibilities of quite new activities, activities made possible by nerve regions never reclaimed by civilized functioning.

A great deal of restlessness is thus a "good sign" in a child. Even choreic movements may indicate a rich inheritance; a child with abundant movements can be trained and directed. The child that is to develop to full rich life must live pretty fully the life of the lower levels, must recapitulate all the life of savage and prehistoric man; otherwise his higher potencies must lack reality and power.

Self-control in muscular movements leads to the question of inhibition. Perhaps inhibition is explained best as irradiation or long-circuiting to higher and more complex brain areas so that the energy is diverted to be used elsewhere.

Where the whole brain acts in a unified and well-connected manner it suffers less from localized activity, since any one part of it can draw upon the whole for supplies. Concentration is less dangerous in this type. But in this type change of work is not rest. Rest means restoration of the whole brain area by sleep and lounging. The difference between a well-connected brain and that of a day-labourer lies largely in this, that the former can use all its power at any point while the latter cannot. The student often excels the uneducated not only in sudden strength tests but also in endurance. Children who are to be specialists in activities requiring great muscular skill and exactness, such as piano-playing, should begin them about 7 or 8. From 8 to 12 formal activities of all kinds can be organized and practised with good results.

Sedentary life, foolish forms of play, machines which take the place of certain forms of hard labour, are tending to throw the large muscles out of use and hence to overload the accessory muscles with energy. The diminution of manual labour required to do a given quantity of work in 1884 as compared with 1870 is no less than 70 per cent.

Primitive people both in work and play made enormous muscular efforts in running, climbing, carrying, lifting, wrestling, dancing, etc. Many of our children, especially girls, are thrown out of health by the neglect of large muscles. In these times we find a few excellent bodies but the great majority are puny, shapeless, and weak. The average savage far surpasses the average civilized man in body. It is the very general realization of this that supports the present impulse toward motor education. There is a widespread desire to improve the human body but the means so far devised are neither wise nor successful. There have been cults of deep-breathing, relaxation of muscles, laughing, Delsartian grace and expression, classic posing, yawning, etc. There have been all sorts of books of advice concerning the care of the vital organs. The soil is so rich that it produces flowers and weeds in profusion.

The really great and serious modes of physical education are (1) industrial training, (2) manual training, (3) gymnastics, (4) sports and play games.

Industrial Education with its contempt for mere book-learning, its sense of useful service and independence, has great merit, but adolescents must

learn many trades, like Colonial pioneers, and exercise muscles big and tle in a struggle for a liberal education.

Manual training aims rather at education than at wage-earning. T hand is the organ that has done most for human evolution and to train is to train the brain behind it. This is so far good but in practice the l back and trunk are neglected and considerations of symmetry and balar ignored. The whole system has been entered upon without any grasp its needs and tendencies and has become rigid, hollow and artificial. Alrea it is breaking down and giving way to broader and wiser ideas.

The system known as "Sloyd" (the word means skillful) has spec claims. It works in wood only. It has a philosophical idea and aims at re education but is singularly weak in psychology and physiology. Its metho lack scientific reasons. As taught in America it has failed to adapt its to American conditions.

All these movements breathe, however, the fine spirit of Carlyl Ruskin, Morris and others who believe we must return to manual skill if w are to have a revival of sincere art. We cannot and should not make woi play in any light sense. Only the hardest efforts are crowned with real su cess as the remarkable paper of Bryan and Harter on the psychology (learning speed in telegraphy teaches us (page 182).

The growth of skill follows a peculiar and interesting curve. Improv ment in telegraphing, type-writing, learning German, etc., etc., advances in a irregular but significant climbing curve, involving moments of discourag ment and marking time. But it is those who struggle on to "second wind, through intense and fatiguing concentration, that become experts.

In learning a foreign language, speaking is first and easiest, and hea ing takes a late but often sudden start to independence. Perhaps this hold of every ability. To Bryan this suggests a "hierarchy of habits;" lower or der habits approach perfect functioning but do not leave the attention fre to attack higher order habits. Later there is drudgery at this higher habi followed by automatism, that is freedom, on the higher level, and so on, til the physiological limit is reached.

A special application of this general law is found in studies of art pro clivities of children. There are periods when children try to create an periods when they absorb and criticise.

From ten to fifteen children "hate drawing" because their increase knowledge and critical appreciation makes their work absurd to them From infancy to twenty there are three periods, in the first and third o which appreciation surpasses creative effort. Children try to draw and en joy trying between four or five and about ten. This law may be observed ii relation to certain other activities.

The critical period should dwell more upon the content and analysi of art works, and fine ideas of life and form. When the creative impuls recurs after the early adolescent critical period, it is likely to assume form of idealism that are too ambitious and idealistic; these should be treate sympathetically.

In conclusion of these phases of physical culture it should be observe that industrial and manual training should work harmoniously and that thi country needs an immense increase of schools and teachers in this direction

Gymnastics is a term for exercises whose sole purpose is physica

culture. This is essentially modern, training in antiquity was for games, war, etc.

A. The great German revival of gymnastics was a real inspiration to the Fatherland, spread like wild fire, conquered France and unified the Empire. John is the apostle of this. One of his aims was to do everything physically possible for the body as a mechanism. By every imaginable apparatus and exercise every possible or latent movement was developed. The system ran into pedantry; all sense of proportion was lost and equal value was attached to great and small activities. The whole system needs organization on a broad scientific basis and one of the needed norms might be supplied by phyletic emphasis.

The movement is seen in this country in the Y. M. C. A. gymnasium where physical culture is now a kind of religion. This physical salvation is one of the most splendid chapters in modern history. The danger a boy runs in these gymnasiums arise chiefly from three causes (1) the extreme difficulty of judging the quantity and kind of training needed (2) the impossibility of ascertaining the hereditary weak points of the individual, and of adopting exercises to the stage of development in any year of life, and (3) the impossibility of studying individual differences in large classes. No doubt these gymnasium classes do much harm.

B. A second aim of gymnastics is to mentalize the body and to make all movements with consciousness (Swedish Commando exercises and Delsarte method). This becomes a training of muscles. Instructive actions are analyzed and their parts set free for new groupings leading to new skill and functionings. Tensions that are useless drains become relaxed.

The danger of this system is that it places artificial acts above natural and instructive acts, and many of the new groupings lead to no useful synthesis. The method is promising but needs a wiser psychology and purpose.

C. Ling's system of economic postures and movements is full of suggestion. It aims at easy and restful postures and carriage and at compensating for unnatural attitudes such as prolonged sitting and for one-sided exercises forced upon us by modern life. Its fault has been the usual one of neglect of the individual case and mechanical inflexibility of method.

D. The fourth aim of gymnastics has been correct symmetry and proportion. The ideal is not the Greek statue but the average measurements of large groups properly selected as to age, weight, height, etc. This method arouses real interest in the young, shows them their defects and encourages right living. It easily passes over into a method of inner proportion and mental vigor and symmetry. Its danger is that it runs contrary to the law of special aptitudes which teaches us to develop our strong points in favour of special distinction rather than to build up weak parts. The truth here must be a compromise.

These four aims of modern gymnastics are not harmonized into one great system. The Swedish, Turner, Sargeant and American systems are still blind to each other's merits. Never was a great man more needed than in this field of physical culture. He would be the idol of youth and a real saviour of men's bodies. The Turnfest gives suggestions of what enthusiasm and effort are latent here.

Those who are still skeptical as to what can be done for weak children by wise gymnastics will be convinced by the recorded facts. Sandow him-

self was a rather weakly boy. He attributes his health and strength to gymnastics. Beyer thinks that the average man could be trained to the feats of our strongest men. We have seventy times as many physicians to the whole population as physical directors to the school population. We have twice as many physicians per population as England and four times as many as Germany.

Field and track sports are in this country wisely connected with gymnastics and the records here are inspiring in their progress from year to year. Greek gymnastics did nothing to correct the ravages of work or to overcome hereditary defects and knew nothing of apparatus, exercises, and measurements, independent of games.

Modern gymnastics do more for the trunk, shoulders and arms than for the legs. They have proved a great aid to temperance and virtue. Their most serious defect from a philosophic point of view is the lack of subordination to higher ends. The body is not an end but a means and the care and development of it should pass over into care and development of the mind and heart.

There are many means of connecting brain-work with physical culture such as studies in biometrics, anthropometry, anatomy, hygiene, the history of gymnastics, etc. If these were cultivated, gymnastics might become a major in an A. B. course, intellectual students would be interested, and tendencies to brutality suppressed. We should also get a higher type of director, who would ally his department with college ideals instead of appealing to the instincts of rowdyism. The rooter could spend his enthusiasm in showing superior knowledge in the field of history of gymnastics and achieve such manners in relation to games as become his class and race.

IV. **Play, Sports and Games** form the oldest and most popular field of physical education.

Play is to be regarded not as Gross regards it, that is as childish practice for future adult activities, but as the spirit and activities of the past persisting in the present. In play every mood and movement is instinct with heredity. Playing children are acting over again the dramatic history of the human race in all its works, wars, struggles and habits. It is the lost paradise of barbarism, savagery, prehistoric communities and even prehuman life in woods and water. It is our muscle-history re-enacted in individual childhood. Unlike gymnastics it is deep-rooted in the heart of man and has soul as well as body. Play over-emphasizes neither mind nor body. It is when rightly understood the ideal exercise for the young. The Olympic games were not mere trials of strength, they were "a modern prize exhibition a camp-meeting, fair, Derby-day, Wagner festival, a meeting of the British association, a country cattle show, intercollegiate games, and mediaeval tournament." The honours there achieved were, the highest the race could offer. The true athlete was a moralist and philosopher, not a gladiator; knowing and doing were at one and knowledge was life and health. Virtue and perfect manhood were identical. The premature localization of the affections in sex was avoided by joyful activity and diffused exhilaration.

And in our own times a play is the test of the integrity of the soul. Old age is the absence of the soul and body of play. The plays that succeed today are rooted in the real life of the past. Skill in throwing was once a necessity of survival. Baseball in many phases is phyletically familiar.

Fishing has come down unchanged. The best plays are those which have this phyletic sanction. The very order in which plays are most helpful must be learned from evolution. Gymnastics that work marvels at one age of a boy's life fail utterly at other ages. The determination of the onto-phylogenetic parallelism is of the utmost practical importance in this chapter of education.

Doll-plays culminate at eight or nine and nearly end at fifteen. There is no reason to think that children who love dolls make the best mothers. The play is a rehearsal of the past of the race, not a practice for future adult life.

Gulick divides childhood into three play periods. Before seven spontaneous play is rare; from seven to twelve plays are individualistic and competitive; from puberty on team games with captains predominate.

The games of the chase rise from eleven per cent at six to nineteen at nine, and then fall to four per cent at sixteen This is suggestive for the recapitulation theory. Contest games and society games are similarly suggestive of the phyletic curve. Indeed, wherever research has been made we find valuable suggestions as to the parallel between the child's ever changing interest in new games and the changing of the race in its evolution.

One of the most important aspects of muscular life is the rhythmic nature of human movements. The movements of primitive peoples are rhythmic and automatic. In some early stage, work, play and art had this rhythmic quality in common. Work-songs lightened labour. Adolescence is the great age of ryhthmic movements. Nearly all games show this in some degree. Psychic rhythm increases and helps mental work by increasing the carrying-power of attention and the sentence-span. War, love and religion are enforced by it.

Dancing is a primitive and profound expression of rhythm. Most of the great religions have made use of it. Basil and Gregory introduced it into religious services. All the great nations have characteristic dances. The culture value of dancing is inestimable as it gives expression to all moods even better than music. Modern dancing is degenerate and often harmful. Dancing should be reformed, not suppressed.

A striking difference between savage and civilized races is in the rhythm-span of work and rest. Savages rest for very long intervals and then work furiously without relaxation. Darwin thinks all vital functions are periodical, as vertebrates are descended from a tidal ascidian. Many adolescents show primitive traits, doing their work by furious energy and then indulging in long lazy periods. Excess seems necessary in adolescence, to develop new tissues and flood new areas. "Second wind" seems to be a phase of this need.

The fighting tendencies of adolescence are markedly phyletic. The cruelty of boys is evinced in countless more or less shocking forms. There is also a marked love of cruel sports in the most advanced adults. These traits have precipitated a dislike for all fighting in certain classes. But the doctrine of non-resistance or peaceful Quakerlike patience under injury is unmanly and undermines individual and national honour and morality. The great English schools regulate fighting and recognize its value in forming character. Pugilism is a manly art and leads to psychic powers of leadership and robustness. Anger is an essential of sound character. But anger and fighting must be raised to a high plane of honour and service. Paulsen,

a wise judge of practical ethics, regards German duelling as a slight evil. Several Americans rank it above hazing which it renders impossible. But the duelling system is weak mainly because its code of honour is not coincident with the line that separates real honour from dishonour. Fencing is an exercise of some merit but is unilateral.

The honor-ethics of Japan, Buschido, is a grand system and is the soul of Japan. Better than most similar systems it harmonizes the athletic life and the soul life, so that every physical act gets an inner meaning. Loyalty, modesty and reckless courage are its chief features.

Wrestling is a glorious exercise which practises every muscle and develops alertness of mind as well as good temper and self-control. It is quite peculiar in the training it offers to the flexor muscles.

All warlike training develops love of home and country and checks cynicism, censoriousness, cowardice and moral corruption. Love and war have always gone hand in hand because strength and courage alone can defend home and fatherland. Sports that simulate war are allied to war psychogenetically. We need cleaner sports. The spirit that will win at any cost, by trickery and secret practice is wholly bad. Honor is better than the silly applause of fans and rooters. [It is reported that in an international tennis-match the famous Doherty was given a decision favourable to himself which he regarded as unjust to his opponent. He said nothing. But when the next ball was served he purposely missed. He lost the set and the match by this great act of magnanimity. But he won the applause of all true sportsmen.] The press and the friends and patrons of sports often lack the fine chivalrous sense that is the great glory of pure sport. When players realize the higher delight in the admiration of men of honour they will gladly abandon their mode of bidding for cheap and clamourous applause. But even as things are, the good far predominates, and the tendency is most promising.

The type of man turned out by our military and naval schools is worth studying. The military training of European peasants is a genuine education in discipline, carriage, and cooperation. The military element might be introduced with advantage into most schools.

The relation of fighting to love persists in the superior work done by athletes under the eyes of women they respect. The mild religions of the later Jews and ancient Hindus, both fighting races, were not accepted in their own countries but in lands where women had more influence. The general effect of feminine and Christian influence has been not to extirpate fighting qualities but to refine and exalt them in form and purpose and above all to make soldiers knightly and chivalrous.

Cold bathing is peculiarly an English regimen. Swimming is second to no exercise, especially in its value for non-striated muscles and circulation. The freedom from clothes, and running on the beach, bring us back to primitive life. The warm bath tub is enfeebling and degenerative. Schools should greatly increase facilities for proper bathing and water-exercises. Much is being done in this direction.

Leg exercise needs far greater attention than it gets. Swinging has a deep phyletic root. Skating has many merits of the highest significance for body and mind. Arm-work is relatively over-done in modern gymnasia. We must above all overcome the evils of sitting too much. Hill-climbing is an ideal exercise.

The play-question is in full swing in this country. All kinds of devices are being offered. But the great defects are found to arise from lack of a real system based in biological science and adapting the kind and degree of the exercise to the age and and needs of the individual. It is just here that psychology of adolescence must do its work. The play-ground movement in cities is difficult to direct, but the tough and the hoodlum have heroic traits and the bad traits must be eliminated.

Student athletics have obvious merits and obvious dangers. The often trivial and empty conversation of students is turned to useful discussion of diet, exercise and points of honour. This increased interest in ideas demands more interesting teaching. The business affairs of athletics give valuable training. The dangers are the neglect of study, the hysterical rejoicing and lamentation over victory and defeat, [which are contrary to the equanimity so valuable in the game of life], the turning the heads of the successful by applause of press and spectators, the friction with faculties who take unpopular sides, and the erethic diathesis which makes monotonous work distasteful and dull in later years.

Professionalism, and the tendency to codify games for the whole nation, and to standardize equipment, have much to be said against them. The tendency to over-specialize training by making one man nothing but a pole-vaulter etc., has its drawbacks. [other things being equal, the games that can be played well on into middle life such as tennis, cricket and golf are of more use to a man than those that must end at 26 or 27.]

On the whole the scientific opinion since the Berlin Play Congress of 1894 has been in favour of plays, games and sports rather than gymnastics, both for soul and body. [From this point of view a game like American football which trains only a few of the heaviest and strongest men does but little for a university.]

We need not here define work and play. As Brinton says, the best play has the most work and the best work has the most play. The playful spirit is often a character of true greatness. England in her greatest periods has been the greatest home of sports and play. The play spirit is one of lively interest and may be found in tennis, or in higher mathematics; it is essential to true poetry. The fall of man was the necessity of doing things without zest, his rise will be in doing necessary things as a labour of love. Duty itself may become a passion. Play means a pleased interest and its subject-matter has no limits.

The day will come when these two provinces of work and play will coincide, and it is erroneous to speak of play and interest as something superficial and trivial. The roots of play lie close to those of imagination and creation, but nothing can be worse than to make play seem something easy. The true doctrine of making work and study interesting is not to make them cheap and superficial but to lend the glamour of enthusiasm and power to the dullest and dryest drudgery. The best play is true genius and man is only completely master of his work when it has become a delight.

ON GENERALIZATIONS IN GEOMETRY.°

By SAUL EPSTEEN, Ph. D.

Instructor of Mathematics.

In the book entitled "The Teaching of Elementary Mathematics," * on pages 279-282, Professor D. E. Smith advocates, in instruction of geometry, a judicious generalization of figures. One of these methods of generalization consists in considering negative as well as positive line segments. Consider for example the well-known theorem that the square of the side opposite an obtuse angle is equal to the sum of the squares on the other sides plus twice a certain rectangle; as the angle becomes less obtuse, this rectangle becomes smaller, if the angle becomes right, the rectangle vanishes and the theorem becomes the Pythagorean; if the angle becomes acute, a certain projection becomes negative, making the rectangle negative, and instead of having plus twice a certain rectangle we have minus twice that rectangle; the theorem becoming the one concerning the square on the side opposite an acute angle.

While this generalization of typical figures materially lessens the detail of geometry, Professor Smith is careful to warn the teacher against going to extremes. Thus, he indicates that the propositions concerning the measure of an inscribe angle; an angle formed by a tangent and a chord; an angle formed by two chords; by two secants; by a secant and a tangent; by two tangents; are all special cases of a single theorem, but he advises the teaching of the general theorem after the special cases have been mastered.

The following seven propositions wihch are to be found in every text book on Elementary Geometry are usually demonstrated independently of each other, ** without regard to the intimate relation between them; and the student of course fails to see the connection which exists.

1. The bisector of the angles of a triangle are concurrent.

2. The bisector of one angle of a triangle and the bisector of the exterior angles at the other two vertices are concurrent.

3. The perpendicular bisectors of the sides of a triangle are concurrent.

4. The altitudes of a triangle are concurrent.

5. The straight lines joining the vertices of a triangle with the points of a contact of the inscribed circle are concurrent.

° Read before the Mathematics Club of the University of Colorado, October. 4, 1905.

* The Teaching of Elementary Mathematics by David Eugene Smith of Columbia University, N. Y., MacMillen, 1902.

** Sometimes No. 4 is demonstrated as a corollory of No. 3 by constructing through the vertices of the given triangle, another triangle whose sides are parallel to the sides of the given one.

The same method of demonstration is used in No. 2 as in No. 1.

6. The straight lines which join the vertices of a triangle with the points of contact of an escribed circle are concurrent.

7. The medians of a triangle are concurrent.

As a matter of fact all seven of these propositions are corollaries of the following:

FUNDAMENTAL THEOREM: **If through any point 0 in the plane of a triangle A B C lines be drawn to the vertices cutting the oposite sides in a, b, c, then**

$$\frac{aB}{aC} \cdot \frac{bC}{bA} \cdot \frac{cA}{cB} = 1;$$

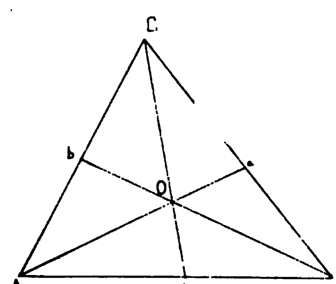

Fig. 1

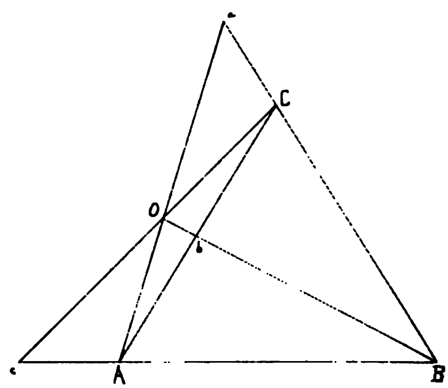

Fig. 2

and conversely if $\frac{aB}{aC} \cdot \frac{bC}{bA} \cdot \frac{cA}{cB} = 1,$

then the lines Aa, Bb, Cc are concurent.

The proof of this proposition is based on two well-known theorems:

(a) The areas of two triangles having one angle in each equal are to each other as the rectangles of the sides which contain the equal angle; and conversely;

(b) The areas of two triangles of the same altitude are to each other as their bases; and the areas of two triangles of the same base are to each other as their altitudes.

We have in either figure the identity

$$\frac{OA \quad Oc}{Oa \quad OC} \cdot \frac{OB \quad Oa}{Ob \quad OA} \cdot \frac{OC \quad Ob}{Oc \quad OB} = 1.$$

or, by (a)

$$\frac{\text{area} \quad OAc}{\text{area} \quad OaC} \cdot \frac{\text{area } OBa}{\text{area } ObA} \cdot \frac{\text{area } OCb}{\text{area } OcB} = 1.$$

Rearranging terms

$$\frac{OBa}{OaC} \cdot \frac{OCb}{ObA} \cdot \frac{OAc}{OcB} = 1,$$

hence by (b), and taking into consideration the signs of the segments,

$$\frac{aB}{aC} \cdot \frac{bC}{bA} \cdot \frac{cA}{cB} = -1.$$

To demonstrate the converse we let Aa, Bb meet in O, draw CO meeting A B in d, then

$$\frac{aB}{aC} \cdot \frac{bC}{bA} \cdot \frac{dA}{dB} = -1,$$

whence $\dfrac{dA}{dB} = \dfrac{cA}{cB}$ and therefore d coincides with c.

After he has mastered the seven special cases it should be pointed out to the student how they all follow as corollaries from the general theorem, at once so simple and yet so comprehensive in its scope.

An easy way of remembering the above fundamental relation is to observe that the leters A, B, C, occur in the order

$$\frac{B \quad C \quad A}{C \quad A \quad B} \quad \text{in} \quad \frac{aB}{aC} \quad \frac{bC}{bA} \quad \frac{cA}{cB} = -1.$$

The method of deducing proposition (7) as a special case of the fundamental proposition is evident. With the aid of the following hints it will be easy to deduce the other six.

(1H; 2H) The bisector of an angle (internal or external) of a triangle divides the base into segments which are proportional to the other two sides.

(3H) Construct a new triangle by joining the middle points of the sides; this reduces the problem to No. 4.

(4H) The pairs of triangles AaC, BbC; AaB, CcB; CcA, BbA, are similar.

(5H) If a, b, c, (fig. 1) are the points of contact, and if s denotes half the sum of the sides, then bA Ac s—CB; cB Ba s—AC; aC Cb s—AB

(6H) If a, b, c, (fig. 2) are the points of contact, then Ba Bc s; aC Cb s—AB; bA cA s—CB.

The following theorem, which is not as common as the other seven, is also a special case of the fundamental theorem. If a straight line be drawn parallel to the side B C of the triangle A B C, cutting AB in D and AC in E, the lines BE, DC meet on the median AM. In proof, we note that

$$\frac{AD}{BD} = \frac{AE,}{CE}$$

whence, AD. CE BD. AE, and therefore AD. BM. CE BD. AE. CM.

University of Colorado
Boulder, Colo., November, 1905.

MOTOR ACTIVITY AND MENTAL SELECTION.

By JOSEPH HERSHEY BAIR, Ph. D.

Professor of Psychology and Education.

When empirical psychology made its advent as one of the branches of scientific quest the interest manifested in it was entirely along the line of observations on the senses, and on the sensory side of mental life. Movements wherever involved, were of interest not as produced but as perceived. Much was written on the sensations, perception, and memory of movements, but they were never regarded as indispensable elements of mental states. Physicians probably took the initiative in developing an interest in movements and their bearing on the individual's well-being. This interest was at first limited to the relation between motor activity and general health, but soon grew to an appreciation of its part played in mental diseases and its general bearing on the mental side. Since movements were thus recognized as essential factors in conscious life, psychologists have manifested a wide interest in their investigation. Educators, too, have caught up the spirit of their importance in teaching and seek everywhere their application in the learning process. Beginning as they did in a narrow sphere of application in education, they have now extended motor activity to nearly all forms of mental training. This expresses a definite reaction against the old formal methods in the primary schools and the classics in the higher ones. It is phenomenal how within a decade industrial and mechanical schools have sprung up. Indeed manual training has become, to a considerable degree, the end of school functioning rather than the means of acquisition, and in so far as this is the case its product will be less efficient in meeting the demands of modern conditions than was that of the old curriculum.

The purpose of this discussion is to show how motor activity is essentially involved in all learning operations and how it becomes a selective factor in all mental activity. Motor activity embraces a wide range of application—a hygienic, an educational, and a psychological. All three of these are of vital importance to educators, and the education and well-being of the future generations depends to a considerable extent upon the efficient application and inculcation of these principles in the public schools. Education today generally involves some form of motor activity but the purpose is oftimes obscured through the lack of comprehension of the deeper principles involved. There are two points ot view regarding motor training, the first insists on strict, formal, carefully prescrbed activity, in which all of the child's attitudes are directed and coerced until they become habitual. The second holds natural attitudes to be the best conditions for learning, and therefore allows the child to follow its own inclinations in each situation. When the principles below outlined are understood the reader will invariably accept the first point of view. He will appreciate the importance of requiring right motor adjustments from the child, and their bearing on

the health, disposition and ability to learn. The law of habituation must be ranked as the first and most important educational principle. Formation of habits is inevitable, and the most important thing in the child's education is to require him to form correct habits. The idea that the child should be allowed to form habits in consonance with natural inclinations is ridiculous. A man is his habits. If they are natural aptitudes automatized they will imply no power of resistance nor self denial, and every whim and caprice will be an over-ruling factor in self realization.

To understand the nature of habit one must have a general comprehension of the fundamental basis of habituation. Science is everywhere characterized by going forward from the single unconnected data to their general relations. The educator here, as in any other aspect of his art, must have a broad insight into the nature of mind. As a scientific undertaking human nature is not explained by a summary of the mental processes of the human brain but by an attempt also to work out their general connection and the causal laws which underly them. Mind and body develop together in the evolution of the human race. Natural selection has long operated in developing the motor mechanism. Natural selection is also responsible for the reactions which this motor mechanism makes to the various stimuli with which it comes in contact. Through a long adjustment process there developed a great organic world in which feelings (or emotions) are expressed in a system of signs (1). These signs are motor adjustments and are, or originally were, useful ways of reaching in maintaining, sustaining, and perpetuating life. Many of these motor adjustments show that they are at all times connected each with definite mental states, thus affording a basis for mind reading. The tendency to respond to a stimulus in a fixed way is phylogenetic, i. e, inborn. As for example, when one catches sight of a hideous spectacle one shrinks. And there accompanies it a feeling of fear. Whenever this shrinking takes place fear exists. There are many reactions, each of which has its peculiar native, mental concomitant. (2) This motor-emotional connection is not limited to human nature but applies to every living creature as well.

In the human being emotional habituation is as inevitable as the development of associations. By emotional habituation is meant that the body tends to a continual adjustment consonant with some emotional attitude. Every stimulus tends to bring forth a response with the habitual emotional tinge to it. This is what is meant by disposition. There are potentially as many emotional dispositions as there are emotional elements, or native motor adjustments.

A great deal of the power in animals to communicate is due to consonance of reaction. When one animal gives the danger call all his fellows run away. When the old hen gives the danger chuckle all the chicks scramble away to hiding places, even the chick still in the shell will crouch. A lecturer brings forth sympathetic responses from his audience largely by the tone of his voice. In the theatre the voice intonations of the actor together with other essential reactions call forth from the various members of the audience convulsive sympathetic sobs for the hero, or gusts of contempt for the villian.

(1) Darwin, Expression of Emotions.

(2). James, Principles of Psychology. Chapter on Emotions.

Every response tends to have an emotional element in it, and this is especially true of animals. Man uses arbitrary responses which are characterized rather as intellectual than emotional. These responses are embodied in language. By this system of arbitrary responses to objects man makes most of his associations and intellectual activity is made possible. All the higher faculties in man are brought into play by means of language. For every object there is a conventional response. Every response is associated with its object until its image is brought to the mind by its utterance or the hearing of it. The creature with a language does not always respond to the stimuli immediately present. Its world is an ideal one, and the stimuli to which its responds are ideally present. Language makes it possible to control the imagery. We can control the imagery of others in so far as we have common responses, i. e., the same language. Creatures not equipped with these conventional responses can communicate only natively, i. e. only in so far as the same stimulus effects them alike. Mankind continually is bringing into play in communication both the native and conventional elements.

Education works upon those native elements in a marvelous way. Right motor training ultimately brings the body into an adjustment antagonistic to the native response. For example, if the body through habituation is in a tense adjustment any stimulus that would naturally produce an emotional response, i. e., of grief, will not succeed in making an impression on the body and consequently none upon the mind, because the inertia of the habitual adjustment is too great to be overcome by the antagonistic stimulus.

The dispositions we should like our children to have, and the mental life we should like them to lead, are all conditioned by the motor habits we would have them acquire. Habit is defined by a tendency to act in a given way to a particular stimulus. A habit is also an element in a general bodily adjustment. Our habitual bodily adjustment conditions our mental content. Thoughts do not tend to appear that are antagonistic to the habitual adjustment (3). If we attempt to thrust out of consciousness any idea or emotion the attempt only serves to heighten and intensify the idea. We are successful in inhibiting mental states only when working through the motor adjustment of the body (4). A change in the bodily adjustment tends to bring about a change in the imagery attending it. So does the imagery tend to interrupt whatever movement we may be making that is not involved in the ideal process. "Whenever we fall into a brown study we slacken our pace or even come to a stand still." (5). The centripetal stimulus goes over into centrifugal impulses (6) as well as the centrifugal impulses appropriate the molecular energy of counter impulses. When we say the brain thinks the whole body enters into activity. We cannot imagine a movement without by that means calling into play actual muscular feeling through the centrifugal impulse (7). All of this shows the integral relationship between body and

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(3). Saxinger, Ueber der Einfluss der Gefuhle auf der Vorstellungsbewegung, Zeitschr. f. Psy. u. Phys. d. sinnes Organa Bd. 27, Heft 1 u 2, S. 18.

(4). Munsterberg, Psychology and Life, P. 92.

(5). Kulpe, Outlines of Psychology, P. 433.

(6). Fere, Sensation et Mouvement, P. 25.

(7). Stricker, Bewegungsvorstellung, P. 27. ff.

mind, and it is easy to see how mental selection is dependent on habitual motor adjustment and vice versa.

Habitual adjustment characterizes disposition. Disposition implies a narrowness of responses. What is meant by disposition can be made clear by a comparison with the strings of a musical instrument which respond only to stimuli in consonance with their particular rate of vibration. The different vibration rates characterize the different dispositions. A jovial disposition means "high strung" so as to respond to those stimuli that are exhilarating. A sad disposition implies relaxation, and responds to depressing stimuli. A disposition is sometimes very quickly formed. A person having one reverse may become "soured." There are many instances of broken heartedness where the wronged person permanently relaxes and sees only the jaundiced side of life. It is much easier to form disposition of relaxation than of innervation.

A sad disposition involves an attitude of relaxation. The muscles are flabby, the gait unsteady, the chest drawn in, the breathing shallow, mouth slightly open, and countenance drooping. In a gay disposition the muscles are rigid, the chest inflated, and all other attitudes are just the opposite from sadness. The breathing is vigorous and the contenance radiant. Certain dispositions have some motor attitudes in common, so also are certain of their mental concomitants similar. Grief or sadness have a number of common characteristics with humility. By comparing the motor elements, the relationships of the mental characteristics of the various dispositions can be ascertained.

Two persons of different dispositions respond entirely differently to the things they are brought in contract with. Each pays attention to those things in harmony with his adjustment. They may go hand in hand over the same ground and have the same stimuli presented to the sensorium, yet they attend to entirely different things . Consciousness is selective. Each attends to those elements in the situation to which he is adjusted. We form attention dispositions, i. e., we form habits of regarding certain stimuli present and ignoring others, just as in emotional dispositions.

Emotional and attention dispositions are continually reinforced by the apperceptional factors. As a result of sustained interest in certain stimuli to the exclusion of all others, and of certain emotional adjustments, those ideas in harmony with such adjustments enter consciousness and become a reinforcing agent in the adjustment. One of the laws of acquisition is that we see what we have seen, we feel what we have felt. We are interested in what has held our attention. One idea favors the admission into the mind of another like it. The more ideas of a kind in the mind, the more likely it is for the attention to dwell upon that type of ideas. The ideas in the mind tend to keep the body in an adjustment favorable to the propagation of their type. This reinforced adjustment necessitates selective consciousness. It is therefore urgent that we inculcate into children careful bodily postures. If we require them to keep the muscles rigid, to breathe vigorously and to keep the body erect they will be in a position to absorb from the environment those elements that are invigorating and give the mind a healthy tone, and reinforce this assumed adjustment until it is habitual. If on the other hand no effort is made to develop a favorable adjustment it is likely that the innervation will not be so rigid and that the mind becomes mor-

bid and sensuous. Letting oneself go, especially in childhood, endangers an habitual relaxation, whereas, if innervation is required from the child, selective consciousness will reinforce the favorable posture and in the adult insure such mental selection which makes for a useful, agreeable, and happy citizen.

The question now comes, what can be done for a person of unfavorable disposition? Must he remain so? Must a depressed or melancholic person remain so and become more confirmed through selective consciousness? If there is any integral relationship between body and mind as is assumed in this discussion, then the question is not difficult to answer. In a great many diseases the cause is bad adjustment or relaxation. Loss of spirit, lack of tone, apathy, discouragement, and melancholia can all be combated by means of change of adjustment. There is no balm like "bracing up." It implies a continuous effort of the will. One must keep on bracing up until the new adjustment has supplanted the old and becomes habitual. This is like developing an interest in a new subject. One must attend voluntarily until he has enough ideas on the subject to reinforce the adjustment and command attention. If any one holds himself antagonistic, by effort of the will, to the habitual adjustment, he will find himself continually lapsing back to the old adjustment and must bring himself back by renewed effort until the new habit is automatic. If we catch ourselves having the "blues" and observe the adjustment, we may notice in it elements of relaxation, a drawn-in chest, shallow breathing. The remedy here is tightening and straightening up. Whoever felt depressed while doing this voluntarily! It is only as we allow ourselves to lapse back to the relaxed attitude, that it comes upon us again. A flabby person has not the same degree of life and awareness as an innervated one. This can be illustrated by sleep. Sleep implies complete relaxation. A sleeping person is like a broken string, so completely relaxed as not to respond to any stimuli whatever. Who has not tried to go to sleep! The harder one tries the more awake one becomes. Trying implies effort, a greater inervation of the muscles, and consequently a greater tendency to wakefulness. Insomnia can only be overcome by learning to relax.

To sum up, I have attempted to impress the fact of the integral relationship between mind and body, and that every aspect of mental life and consciousness is intricately bound up with motor activity and bodily adjustment It is through movement responses that representation is possible. Speech responses are most utilized in ideation, but other abritrary responses might as well serve the purpose. The emotions are the mental concomitants of certain native response adjustments to stimuli. These responses are universal for each emotion throughout the animal world and were developed by natural selection. By responding natively to a given situation for a number of times until that response becomes habitual there developes a greater and greater tendency to respond to all situations in the same way, and the accompanying emotion tends to become fixed in an emotional disposition. This disposition is a powerful factor in selective consciousness. Mental content is cumulative and tends to confirm the disposition. Any given disposition can only be overcome by a continual voluntary adjustment favorable to the antagonistic disposition. Human well being is determined largely by the adjustment the child is required to assume before he is confirmed in habit. There is no line of conquest over nature so fruitful and so productive of well being as that which conditions our mental and physical capacity for life and happiness.

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INVESTIGATIONS

IN THE

Departments of Psychology and Education

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ON THE USE OF LITERATURE*

By George Norlin.

It seems to me, and I think you will agree with me, that the time has never been when it was as hard as it is now to preserve a broad interest in things and a comprehensive sympathy. It is almost a paradox to say that as the world grows more complex the danger increases that the individual life become more narrow.
Society is no longer as it was in Plato's day, the individual "writ in larger letters," nor is the individual, society "writ small." He is but a tiny and, apparently, an inconsequential part of a great and complex organism, and his inevitable fate, if he would not fall by the way, is to mould himself to become some one little part, a bolt or rivet, as it were, in the vast machinery of life. The danger is that in this condition of things the interest and the effort be centered in this small part, and the ability to "see life steadily and see it whole" be weakened or entirely lost. It is the danger of the narrow specialization which the world demands of us.

With most of us the problem of living, of getting on in the world, is fundamental, and, since competition in all branches of activity is daily growing more strenuous, the question of success for each of us becomes constantly a matter of increasing anxiety. The young man has to choose early what he is to do and prepare himself for that one thing as though it were his eternal salvation to do that one thing well.

With this necessity of confining and narrowing the activities, there is, I repeat, the danger of a corresponding narrowness of thought and interest, the danger of starving the soul. Every man, we may say, has unlimited capacities for growth and self-realization, yet the majority of us develop along a very narrow line and there comes into our lives as a result an inevitable poverty. A man so easily fits into a small, narrow groove and stays there. He may rebel, the spirit of restlessness may come upon him, he may hunger daily for freedom and the larger life, but the exacting conflict of living makes a slave of him in spite of himself.

It is here, it seems to me, that literature, the record of the "best that has been thought and known in the world," comes to us as a deliverer and a savior. It offers a sort of vicarious atonement for our shortcomings. It

*An address given before the students of the University in Chapel.

gives by substitution the experiences, the emotions, the life of the world, to us whose experiences are very limited and opportunities for action comparatively few. It delivers us from our prison-house and enables us to travel with the poet in "realms of gold."

You remember, perhaps, the lines of Keats written when Leigh Hunt left prison:

> Kind Hunt was shut in prison, yet has he,
> In his immortal spirit been as free
> As the sky-searching lark and as elate.
> Minion of grandeur think you he did wait?
> Think you he naught but prison walls did see,
> Till, so unwilling, thou unturneds't the key?
> Ah, no! far happier, nobler was his fate;
> In Spenser's halls he strayed and bowers fair,
> Culling enchanted flowers: and he flew
> With daring Milton through the fields of air,
> To regions of his own his genius true
> Took happy flights.

Happy are we if from childhood up we have been trained to lose ourselves in the reading of the best literature, to enrich our imaginations with the world's noblest fancies, for the time may come, it may not seem so now while the blood flows free and strong and youthful hope paints the future golden, but the time may come when we can find escape from the barrenness and poverty of what we choose to call our real life only by drawing on the riches of a well stored mind.

> "Blest is the man who with the sound of song
> Can charm away the heart-ache and forget
> The frost of Penury and stings of Wrong,
> And drown the fatal whisper of Regret!
> Darker are the abodes
> Of Kings, though his be poor,
> While fancies like the Gods
> Pass through his door."

Have you not sometimes, in certain moods, when palled by the humdrum and monotony of every-day life, sought relief by building castles in the air or painting somewhere in the far-off ocean your picture of the Happy Isles where nothing is common, nothing grows stale, and everything is "nearer to the Heart's Desire?" Or if you have been too weary to paint such magic fancies of your own, have you not found relief in looking on the pictures of another who with finer touch and loftier imagination, but, like yourself, saddened for the moment and grown weary of a sordid world, has built out of the immortal substance of his dreams some Platonic City, some Heavenly Jerusalem, some City of God?

You remember the poem of Kipling in which the three volume novel appears under the figure of the "Three Decker."

> You may see her in the distance,
> Hull down, hull down and under she dwindles to a speck
> With noise of pleasant music and dancing on her deck.
> All's well, all's well aboard her, she's dropped you far behind,
> With a scent of old world roses through the fog that ties you blind.
> Her crews are babes or madmen? Her port is all to make?
> You're manned by truth and science and you steam for steaming's sake?
> Well tinker up your engines, You know your business best.
> She's taking tired people to the Islands of the Blest.

Exactly this, I believe, is one of the functions of literature. It is to "take tired people to the Islands of the Blest." It is to take us out of ourselves, away from the little corner in which our life is spent, to breathe a freer and a different air. It supplies those contrasts which human nature seems to need and without which it must grow stale. It furnishes an outlet to those impulses and emotions of the normal man which if cabined and confined either vitiate his power of feeling or work havoc in the mind. It was Aristotle who first spoke of tragedy as a purification of the passions, meaning, I suppose, that a man can go to a play with murder in his heart or any strong impulse of love or hate, and find it calmed and soothed as his passion's counterpart is acted on the stage.

Just so the man whose restless nature rebels against too much living by the rule, finds a grateful relief in the topsy turvy world of extravagant comedy or in tales of wild adventure. The shop girl whose life is one "demnition grind" revels in romantic novels, "Three Deckers," if you please, which picture a life as different from her own as day is different from night. The invalid whose body is unequal to vigorous physical effort seeks the kind of literature that ministers to his need, like the paralytic whose favorite passage in all poetry was the passage in Browning's Saul describing the joy of action, the joy of free and vigorous living.

> O, our manhood's prime vigour: no spirit feels waste,
> Not a muscle is stopped in its playing, not a sinew unbraced,
> O, the wild joys of living, the leaping from rock to rock
> The strong rending of boughs from the fir tree, the cool, silver shock
> Of the plunge in a pool's living water, the hunt of the bear
> And the sultriness showing the lion is couched in his lair.
>
> * * * *
>
> How good is man's life, the mere living: how fit to employ
> All the heart and the soul and the senses forever in joy.

This, I repeat, is the great thing literature does for us. It supplies our deficiences. It ministers to every mood. It fills out our little lives. It

brings the actions, the adventures, the passions, the problems, the attempted solutions, of the world to our very door. We may live over in imagination the experiences of many generations of men, and the more sympathetically we enter into them, the broader and larger we ourselves become.

It is implied, I suppose, in what I have said that it is not enough for us to read the books of the present though they, perhaps, attract us more because they cater to our indolence. It is indeed better to read the lightest, flimsiest kind of current literature than not to read at all. But we students who are aiming at the larger life must do more than this. We must enter into the works of the past which seem removed from our most ready sympathy and our easiest understanding.

There is a good deal of clamor nowadays that the dead should bury their own dead, that we should concern ourselves only with understanding and helping on the present, as though the present were a thing by itself and not the sum of the life and effort of the past. The past lives in it, conditions it, determines it, and must be studied earnestly if the present is to be at all understood.

It was one of the favorite sayings of Max Mueller that in order to know what men are, we must know what they have been. Now I think you will agree with me that just this is the most important thing for our culture—to know what men are and what they have been, to know what men think and what they have thought; and I hope you will agree with me that for our broadest education it is just as essential, if not more essential, to strive to know and understand the thought of the past as the thought of the present, because the present is in a measure ours already, whereas the past can be understood only by a patient exercise of the sympathetic imagination.

In this, I conceive, lies the difference between the narrow man and the broad man, between the ignorant and the educated. The one looks upon a work of literature from his own point of view and if the book be somewhat removed from his narrow sympathy, he laughs and says "How ridiculous! How absurd! How could any sane man have held such a view?" The other seeks with sympathetic imagination to enter into the inner working of the mind of the writer, to put himself in his place, to look at the world through his eyes, and so, reading himself back into his environment, he will inevitably say "How strange that is—and yet when you come to think of it how natural and true from his point of view!"

Let me remind you of the words of Ruskin on this point. "If you are to get the good out of books," he says, "this is what you have to do. And I admit that it is much. You must in a word love these people if you are to be among them. No mere ambition is of any use. They scorn your ambition. You must love them and show your love by a true desire to be

taught by them and to enter into their thoughts, to enter into theirs, observe, not to find your own expressed by them.

If the person who wrote the book is not wiser than you you need not read it. If he is, he will think differently from you in many respects. Very ready are we to say of a book, 'How good this is, that's exactly what I think,' but the right feeling is, 'How strange that is I never thought of that before, and yet I see it is true, and if I do not now, I hope I shall some day.'

Let me sum up now the thought of this paper by saying that literature is the sum of the world's best thought and experience crystallized into perfection of form, and through its kindly ministration we may live over again the experiences of many. We may dwell in what Ruskin calls King's Treasuries and feel our own poor lives enriched by princely gifts.

The great writers of the world, workers in prose and rhyme, have lived and toiled to bequeath to us the children of their brain, that we "might have life and have it more abundantly."

In closing, I should like to correct an impression I may have given by dwelling so long on one idea. You have perhaps been thinking that I am making a plea for the broad man, rather than the ready man, the book-worm rather than the man who does things, the dreamer who takes the world and its experiences at second hand, rather than the man who plunges into the thick of strenuous living. I do not wish to be so understood. I would not have you think that literature is merely that nepenthe which, dropped into the cup we daily drink, makes us oblivious to our real surroundings, or that it is merely the touch of Aladdin's lamp, which changes the sordid limits of our prison-house into some spacious palace of enchantment. If it does this it does much, but it does more than this. It gives that food to the imagination, that refreshment to the spirit without which no man can make the best out of his daily life, no man can accomplish well his task.

Sometimes, no doubt, it is like the voice of the Sirens, luring a man to the shipwreck of all his powers of action. By a strange decree of fate, the great gifts of the gods have a potency for evil as well as for good, they can destroy as well as save, as they are wisely or unwisely used. But, if a passion for literature, for reading, sometimes dries up the springs of action, it more often lends to ambition a purpose and a goal. If it sometimes makes a man wander idly "amid dreams not realized," it often sends into the world's stress and conflict an Alexander, who with a copy of Homer at his girdle and the golden vision of the great epic in his heart, went forth, a second Achilles, to the conquest of the east.

"We are the music makers
And we are the dreamers of dreams,
Wandering by lone sea-breakers
And sitting by desolate streams:—

World losers and world forsakers
On whom the pale moon gleams:
Yet we are movers and shakers
Of the world forever, it seems.

With wonderful, deathless ditties
We build up the world's great cities
And out of a fabulous story
We fashion an empire's glory.
One man with a dream at pleasure
Shall go forth and conquer a crown,
And three, with a new song's measure,
Can trample a kingdom down."

A METHOD FOR TESTING SCHOOL GRADING.

By T. D. A. Cockerell.

If a thousand adult men are arranged in a row in the order of their height from the tallest to the shortest, it will be found that the line which may be drawn over the tops of their heads will be nearly straight for a long distance, but will abruptly curve upward at one end, and downward at the other. That is to say, the majority more or less closely resemble the average of the whole, but smaller numbers deviate strongly, and the greater the deviation, the greater its rarity. All other attributes which are capable of being measured and expressed by means of a curve, vary in the same sort of way, and when children in school are properly graded, the grades can be made to illustrate the same phenomenon.

In the diagram A, the solid line shows one of these curves, roughly drawn, and rather exaggerated for purposes of clearness. It supposes, of course, that the grades run from zero to 100 (though in practice this is not the case) the vertical line representing the marks obtained, and the horizontal one the individuals, who may be represented by dots placed opposite the mark and above the point assigned to them in order from the highest to the lowest, the dots being afterward connected by a line. It is seen at once that students getting very high or very low grades are much rarer than those getting intermediate ones, and also that the differences are greater between the highest or lowest adjacent individuals, than between the adjacent individuals of ordinary ability.

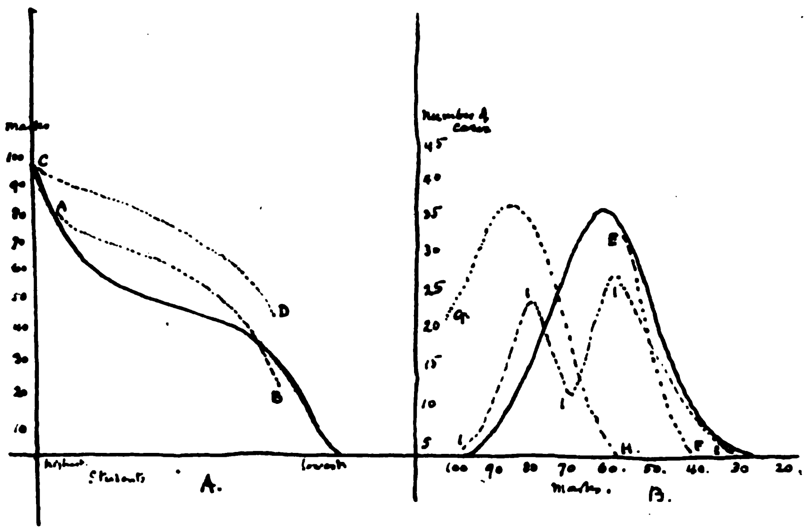
The same thing is expressed by a different sort of curve in diagram B. In this, the horizontal line represents the marking, read from right to left, while the vertical line represents the number of cases of each sort; thus if 25 students get a grade of 60, a dot is placed above the 60 and opposite the 25, and all the dots are connected by a line. This kind of diagram will serve to indicate a very large body of data in a small space. In actual practice, various modifications are necessary. It is not customary to grade those who sink below a certain percent, so that the lower end of the curve is amputated. It is not possible, as a rule, to grade down to single percentages; to get as near as 5 or 10 per cent is usually sufficient. If diagram A is made to fit a grading as fine as one percent, and then used for a coarser one, it will present a number of steps instead of a curve, but these may be connected by a curved line running over the top.

In plotting grades resulting from mathematical examinations, according to the method shown in diagram B, it was found that a double-peaked curve, like that marked I, I, I, I, was obtained; or sometimes one with three peaks. This is due to the fact that in such an examination, those who can solve one problem of a certain degree of difficulty, can usually do others, and hence get a grade represented by that degree of success. If there is a group of still more difficult questions or problems, those who can answer one will probably answer all or nearly all, so that there is a ittle bunch of individuals representing this amount of ability. In other words, the test really arranges the students in a small number of groups, and the appearance of double peaks is artificial, like the steps just mentioned in diagram A. In subjects like history, biology, language, &c., where success does not depend so much upon the correctness of single answers to complicated questions or problems, it is possible to grade more closely. It would, doubtless be possible to do so in mathematics also, and it is perhaps debatable whether the methods commonly in use do not involve some injustice; such as, for example, rewarding the ability to calculate correctly while overlooking reasoning powers of at least equal grade and value.

It was remarked that the lowest end of the curve is usually amputated, those pertaining to it being rejected as failures. Such persons drop out of school in every year, so that the higher we go, the smaller is the number of incompetents, except in respect to abilities which have not been tested lower down. In making out the curves for biology in the second year of the State Preparatory School, it was found that the curve as in diagram A was normal, except that the slope at the lower end was too rapid. This was explained by the selection exercised during the earlier years. In the university, the curve should become still more "skew", except, as just stated, in subjects which call for abilities not heretofore tested.

It appears to me that these diagrammatic methods of representing the facts may be used in various ways by principals, superintendents and others, to test the work done, and particularly the validity of the grading. In a primary school, I have seen a teacher cheerfully give practically every child 100 for a written lesson, and it is doubtless very common to grade too high. At first sight, this seems like justice and generosity combined, likely to hurt no one; but it is, in fact, a great injustice, since it deprives the more skilled of their just rewards. If this method is carried out, it will yield curves like those marked C, D, in diagram A, or A, H, in diagram B, in which the upper end of the curve is amputated, and those who exceed a certain degree of merit get no advantage from the fact. In general, it may be said that if the curve in any respect departs conspicuously from the normal, there is something wrong. It may be asked, what is the normal? The answer is, that there is a general similarity between all such curves, derived from whatever

attributes, sufficient to indicate that the curve C. D. is not adequate; but that the normal expectation for each year and subject, not forgetting race and locality, and methods of teaching, should be worked out, in order to obtain a more accurate test. The averaging of the results of a large number of teachers will help to indicate the desired curves, but correction should be made for any known prevalent bias, such as the tendency to mark too high. It would doubtless be worth while to obtain the temporary services of experts to do this work, and to detect prevalent errors.



It is doubtless true that in nearly all school work full justice is not done to the very able. Probably there are some who should get 150 or 200, according to the usual scale of marking. It might become customary to hold special examinations of greater difficulty, or much better, offer special work adequate to exercise their best abilities, to those who are of the highest class. It is certainly true that talent does not get its just reward at the present time, unless, one would almost be ready to say, it is employed in schemes to fleece the public*

It is impossible at this moment to enter into the larger question of the best methods of ascertaining and estimating ability; but that statistical methods may be usefully employed in this direction—though not to the exclusion of more subtle agencies—cannot be doubted. It must be admitted that the subjects taught in school do not correspond with the different kinds of natural ability, such as memory, power of concentration, perseverance,

*To the old question, what is superior ability worth? we may reply that it is worth what it produces, but not what it can get without producing.

power of comparison, etc., and that it is precisely some of the more important attributes of individuals, such as honesty and sympathy, which elude statistical treatment. The stupid principal or superintendent who would reduce everything to curves, and abandon the finer and less definable methods of judging work done, would be the bane of any school system; but because we cannot tell the gastronomic qualities of a pound of meat by weighing it, that is not sufficient reason for dispensing with the scales.

If it is held that the progress of the individual in school should be as uniform as possible, statistics may help us to avoid errors here. If it is shown that at a certain stage the proportion failing is too great, or that too many do the work easily and get very high marks, there is evidence of something wrong. It may be true that at certain periods in the life of the student, there is natural acceleration or slowing down, as the case may be; but if so, the curriculum should take this into account and offer the amount and kind of work necessary for steady progress. Those who teach in the high school, and especially in the University, frequently have to deplore the absence of suitable kinds of ability in their students—ability which should have been carefully fostered and developed from the start, but has, as a matter of fact, been rather supressed.

Literature.

I have made no attempt to compile a list of references to this subject, but the two following works are suggested as being especially useful.

Francis Galton.—Hereditary Genius (Macmillan & Co., 1892) pp. 12-49.

J. McKeen Cattell.—Examinations, Grades and Credits. Popular Science Monthly, Feb. 1905, pp. 367-378.

THE DEVELOPMENT OF THINKING POWER IN SCHOOL CHILDREN

By Joseph H. Bair.

There is no mental power in which age and maturity, shows more markedly the factor of development than does that of reasoning. In an experiment made upon the children of the public schools of Boulder, Colorado, it was attempted to measure this power in each grade and thus by comparsion to ascertain the rate of its development. After clear and definite instruction was given to the children the test was submitted to them. The test was given to all grades under as nearly as possible similar conditions. The same test was given to all the grades in the public schools, from the third through the high school; and the merits of each paper indicated in percents. The distribution of merits for each class was made, (see figures I—V inclusive) and their average ascertained (figure VI). There were approximately 100 children in each grade.

There were two tests given each grade, one at a time and in immediate succession. The papers of the first test were collected before the second test was submitted. The following were the tests given: 1. A boy said, "I know ten doctors who were all good men and ten policemen who were all bad men, therefore, doctors are better men than policemen." Was he right or wrong? Give reasons for your answer. 2. Mr. Roosevelt said, "There were thirty boys who were all hard students and were promoted every term. Therefore, if you wish to become rich study hard." Was he right or wrong? Give reasons for your answer.

These tests are of the type most readily comprehended by any child of normal intellectual capacity, and afford a pretty equitable basis for the determination of the child's ability to think. The limits within which the judgments are rated are probably too narrow to justify an equitable rating. It is probable that they should include negative values. The results of the third grade (see figure I.) show that 80 per cent of the children in that grade received 0 per cent as their rating. It is obvious that 80 per cent of the children of this grade are not equal in their ability to reason. If any test more generally within the comprehension of the children of this grade were given them their results would more likely indicate a more or less symmetrical distribution about an average; so that the nearer the average, plus and

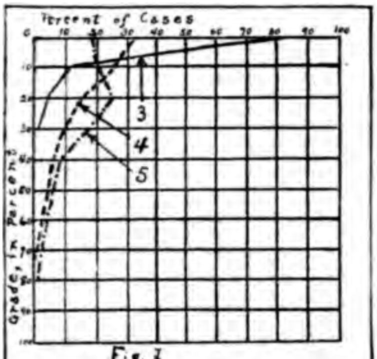


Fig. I

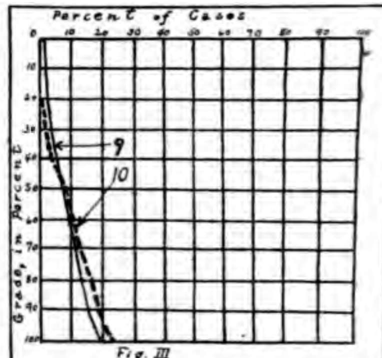


Fig. III

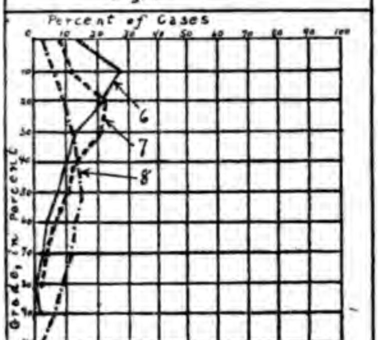


Fig. II

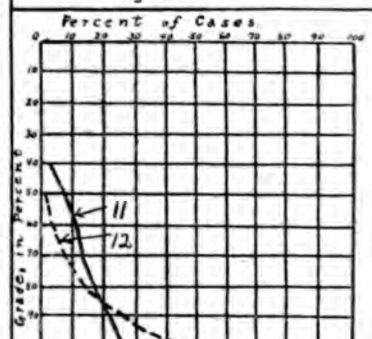


Fig. IV

Distribution in Percent

Grade	0	10	20	30	40	50	60	70	80	90	100
3	31	13	8	1							
4	32	26	16	10	7	5	3	1			
5	19	20	25	17	8	6	3	2	1		
6	14	28	21	14	10	8	3	1	0	1	
7	8	11	22	21	15	10	7	4	2		
8	3	7	10	12	13	14	12	12	9	6	2
9	2	2	3	5	7	9	10	12	14	16	20
10		1	2	3	6	9	11	13	15	18	22
11					2	9	11	14	17	21	26
12						2	4	9	14	26	45

Fig. V.

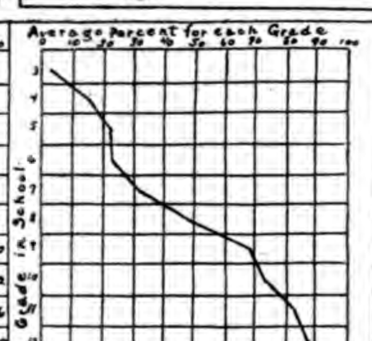


Fig. VI.

Figures I, II, III and IV represent the result in percent of the tests for each grade. Each curve in these figures is numbered. The number represents the grade for which it is the distribution. The horizontal column of figures in the upper margins shows the number of children in each grade who received the percent of merit indicated horizontally opposite in the left hand margin, by the vertical column. Figure V is a table showing the same results as are indicated by the first four figures. Figure VI shows the progressive average, in ability to reason, for the various grades tested.

minus, the greater would be the number of cases, as is shown by the discussion of Mr. Cockerell in this same issue.

The same tests were applied to all the grades included in this study indiscriminately in order to ascertain the relative immaturity of each grade in comparison with a grade of students supposed to be perfect in their ability to form a conclusion in reference to this test.

The above tests compare the different grades with reference to an absolute standard. Another and perhaps more satisfactory, but more difficult test to apply, because of the greater time required in looking over all the papers and rating them, is to present to each grade a number of tests of varying difficulty and complexity. That one in which one grade would measure up with the same average of efficiency as a higher grade would to a more difficult test would be the measure of comparison. In this way a series of tests could be found, which would be equally difficult for the respective grades for which they are standards of comparison. The difficulty of the respective tests would to a considerable degree be commensurate with the intelligence and maturity of the grades compared.

The difference in their ability to think between children of the various ages and degrees of training is not respected enough in our school curriculum. The immature mind is continually plied with complex problems and relations which are beyond the comprehension and with reference to which the response has a 0 per cent value. Too often the material with which children's minds are employed involves factors far beyond their development. One of the most serious common errors among primary teachers is the persistency with which the children are kept at exercise involving constructive thinking.

The fundamental reason why children fail in their power to construct is not because the logical faculty is immature. But it is a fact of development that the logical processes do not function efficiently until the mind has a stock of information which constitutes the material upon which the logical faculty can work. The savage, or ignorant person, as well as the child oftimes arrive at conclusions which are invalid because their concepts are indefinite and their stock of information limited. The primitive man, when he hears wind whistling through the boughs of a tree thinks there is a man or a spirit up there making the sound. This conclusion he reaches because of his notion that sound is always produced by animate beings. To modify and to improve his reasoning his information must be exact and his ideas changed.

The fact that in the Middle Ages arguments were advanced and conclusions supported which are no more tenable is no evidence that in these days the reasoning power is more subtly developed. Quite to the contrary the thinking powers of modern scholars are probably less exercised and de-

velopment than those of those early thinkers. What makes present day thinking more efficient is the fact that for several generations the students have devoted themselves to observing and collecting facts, not to getting acquainted with nature. A century ago the whole spirit of science was to gather facts from nature first hand. Earlier thinkers had many arbitrary notions and preformed ideas about things. When the ideas upon which a conclusion is based are not right no amount of intellectual legerdemain will make the conclusion right.

To lay the foundation for sound thinking the power of observation and discrimination must be constantly exercised and developed. Childhood is for training the senses. Its principal school exercises should be observing, examining, handling, comparing and reproducing. The foundation for the intellect is laid in this manner.

When the naturalist once succeeded in observing and collecting a vast stock of information about Nature it was inevitable for that mind possessed of these facts to construct them into a system. That system, the inevitable result of the assimilation in the mind of these facts about Nature, is embodied in the theory of evolution. This theory has stimulated more than anything else the continued observation of facts. And every idea is modified and conditioned by this theory. No system of thought ever before was so overwhelmingly convincing and so consistent. This is because thought is based upon concrete facts. The Theory of Evolution alone should be sufficient to convince the teacher of the advisability of confining the individual's thinking to the concrete data of his experience.

The more information we get about a thing the more definite will become our idea or concept of that thing. E. g. Compare the child's concept of the world with that of the teacher. As the child's information accumulates his concept of the world gradually broadens and whenever involved in the thought process is a very important factor in the conclusion. It must have occurred to everyone interested in this field of human welfare to what extent one idea or concept conditions every other concept. Our idea of the world modifies our idea of God, of history, of geography, etc., and in fact of every detailed idea we may possess. The first concern of education, therefore, is with the building up of ideas and concepts.

The child's thinking should be confined within the limits of his concrete experience. Every adult who is the product of the older school appreciates the extent to which this principle was violated in his training. I need but refer to Arithmetic as one case. Arithmetic was a "hobby" of many teachers of those days. The entire method of presenting the subject was foreign to experience. The little knowledge the child had was not utilized in the arithmetical problems with which he was concerned. Everything was worked by rule. Grammar was taught by rule, even logic was in this way presented.

It is true that, even logic, in order that it may develop the mind in an efficient manner must be based on concrete data. The order of the development toward thought is: first the child has impressions. Soon is recognizes likenesses and differences. The faculty of perception, recognition and discrimination appear. The child begins to associate and classify the likenesses. Assimilation or appreception takes place. When it classifies the likenesses i. e. assorts them according to their characteristics, labeling is inevitable and thus the concept is formed.

Every time the child puts an object in a class he passes judgment. "This is a pencil." He mentally assimilates this object with a class. Each class of objects has a boundary drawn around it, and in passing judgment the child decides whether the object belongs inside that boundary or not. Judgment involves, therefore, perception and discrimination. Judgment is unavoidably exercised where perception and discrimination take place, and discrimination and perception are impossible except with reference to the objective. In formal exercises of judgment, discrimination and perception are not exercised and this shows the futility of working beyond the bounds of concrete experience with children.

Reasoning is but one step in advance of judgment and implies judgment and all that judgment implies. And so if it can be shown that judgment formally trained is less fruitful than when developed incidentally in the ordinary processes of observation is it not equally true that training in observation is the best ground work for reasoning?

If we take the following illustration of reasoning:

All men are mortal.
John is a man.
Therefore John is mortal.

Is not the whole process a case of refined observation? This can be illustrated by circles. Mortal beings have a large boundary, within which are a great many groups having smaller boundaries. One of these groups is man. Now if John falls within the circle of mankind, which fact is ascertained by judgment through comparison then he must also fall within the larger circle mortal beings. The point I wish to make in this analysis is that teachers should make it their primary object first, to stock the mind with facts, to develop the power of observation and discrimination which are fundamentally involved in all higher forms of thought and secondly, where the higher faculties are exercised, to confine their activity within the realm of the stock of facts in the mind. If this point is complied with in primary education it is certain that the results will be satisfactory.

I give herewith a specimen answer from each grade taken from the middle of the upper half in the series of replies arranged for each grade in the order of merit from worst to best. These show, therefore an ability which is midway between the average and the best ability in the respective grade. There are many replies in each grade among those below the average which show bias, **argumentum ad hominum**, lack of ability to understand what is wanted or to use facts; and it is very difficult to give the reader a comprehension of the significance of these without the opportunity of examining all the replies. I, therefore, do not submit examples but ask the reader to look at the tables of results, in order that he may get an idea of the ability in each grade to think correctly.

3rd. Grade.. "I think he was wrong because the policemen take bad men to jail and doctors save people's lives lots of times."

4th. Grade. "I do not think the man was right because they may spend their lives in study they will not know how to work and will remain poor."

5th. Grade. "Some doctors are better than policemen because some doctors are honorable and kind while some policemen are dishonorable and heartless."

6th Grade. "He was right. The forty boys that got promoted every year by the time they were educated they could get jobs as lawyers or something like that. If they did not get promoted they stop school and dig ditches or do things like that."

7th. Grade. "I do not think he was right because every boy who studies hard will not become rich, he may not care to have wealth. He may study to be useful. No matter what we want to be we ought to study hard just the same."

8th. Grade. "He was not right, because some bad men are doctors as well as some men are bad doctors, just as some good men are policemen. Some bad men may be good policemen. He must not say from just the few that he knows."

High School.

1st. Year. "I don't think the boy was right. Some doctors are better than some policemen and some policemen better than some doctors."

2nd. Year. "He has no right for the reason that a boy should not study hard just for tht sake of getting rich, but should do so partly for fame and partly to bring himself up in such a way as to enjoy life. He should teach himself to do things also because he thinks they ought to be done. The man who has studied hard in order that he might grasp for money is not recognized as much, and is not any better off than the ordinary working man so far as enjoying life is concerned."

3rd. Year. "The boy was not right. The ten particular policemen and the ten particular doctors whom he knew were not examples of all pol-

icemen and doctors. A man taking up the doctor's profession is just exactly the same man in character and disposition as he would be if he should take up the policeman's duties. The mere profession a man takes up has nothing to do with his "goodness" or badness." There are many good men who would make the poorest sort of doctors, but who would make very good policemen and 'vice versa."

4th. Year. "I think doctors as a rule are better than policemen, but as in every other case there are some bad doctors and good policemen. The surroundings of a policeman and the characters he has to deal with tend to influence him toward the bad and to make him hard and cruel, while doctors have different surroundings and being with people in pain and suffering it tends to temper them and to make them better. Almost anyone who has the proper build can be a policeman whereas a doctor if he wishes to have a large practice must be good or people will not care to employ him."

PROPORTION AS THE QUOTIENT OF TWO FORMS OF ONE EQUATION.*

By Heman Burr Leonard
Teaching Fellow in Mathematics.

The present method of solving problems by Proportion or the "Rule of Three" comes down to us from the days when algebra was not generally taught. Then it furnished the only expeditious method by which to solve such problems. Today when the principles of algebra and geometry are being taught in the grammar grades, there seems to be less reason for its retention.

No one will deny that pupils should not be asked to solve problems whose mathematical features they do not completely understand. Of course it is not necessary for one to be a watchmaker in order to be able to solve problems about time, but no pupil should be expected to solve a problem about the relative position of the hands and the clock face before he has been made aware that the minute hand moves twelve times as fast as the hour hand. Moreover the mere assertion of the teacher is not enough; he should be personally convinced of the truth of the statement. And the fact that a method enables him at times when Fortune happens to be on his side to solve problems that he does not understand at all, does not prove that that method must be a sound one, nor that its influence upon him is good. How many pupils feel a proper certainty concerning the result of a problem in proportion? The pupil puts some numbers into the slot of the double dots, turns the crank of cancellation, and a result drops out. If the answer is not correct, he knows that he must turn some of the numbers upside down before he sticks them in again and repeats the process. But does he always know exactly which pair to reverse and if he does, why did he not do it correctly the first time? Does his experience with one problem necessarily give him any help concerning the next problem? Or does it do more than strengthen his conviction that proportion is "cranky stuff"?

The efficiency of proportion depends upon the presence in a problem of conditions common to the two sets. If there are no common conditions, its use offers no advantages. This should be understood by the pupil and in each problem the common conditions should be recognized in some way.

* Read before the Colorado Mathematics Society, February 10, 1906.

This may be done by writing out in words for the given problem a statement of relationship of the conditions grouped together in either set. All who have reached the subject of proportion in the ordinary order of topics can write such statements without much preliminary instruction.

The statement of relationship readily merges into the equation by the use of the initial letters of the words. Its manipulation will always be simple and may be explained by analysis on common sense lines. The ability to write such a statement forms the true test of the mathematical understanding of a problem. Problems for which the student can not do this without assistance should be rewritten in a plainer way or left for a later point in the course when the pupil has more maturity. The solution of such a problem earlier gives no benefit that could not be derived equally from a cancellation problem using abstract numbers. The premature solution has the disadvantage of destroying confidence in the work. Moreover pupils trained to write statements will do better work in physics and in the solution of conditional problems in algebra. How frequently do we hear "If I only had the equation, I could solve the problem"! There is no inherent difficulty here for the pupil accustomed to write statements of the relations in all problems whose meaning he understands. For such a one the preparation of the framework for the solution of a conditional problem has no terrors, even in the cases where he himself can not solve the equations formed.

The method here proposed is to write out in its most natural form for the given problem the relationship of the conditions in either set and then for the younger pupils to transform the statement so that the desired thing stands alone. This modification can be done by analysis, basing each step on common sense considerations. Now this relationship is true for each set of conditions. So write it out for the second set and below again for the first set. Remembering that if equals are divided by equals, the results are equal, divide the second statement by the first and substitute the values for the words used. Considering the expression as two equal fractions, simplify by cancellation, and by multiplication and division complete the solution.

Let us illustrate this method by the solution of a problem.

If 5 men can dig a cellar 48 feet long, 20 feet wide, and 9 feet deep, in 8 days of 8 hours each, how many men must be employed to dig a cellar 60 feet long, 27 feet wide, and 10 feet deep, in 10 days of 10 hours each? *

We must assume that each man does the same amount of work each hour—in other words, one man digs Cu. ft. in one hour. If this is multiplied by the Men working, the product is the work done each hour. This product multiplied by the Hours in a day's work gives the work done each day and the total work done is obtained by multiplying by the Days of work.

* Ray's Test Problems (in Arithmetic), page 141 number 24.

(Cu. ft.)(Men)(Hours(Days) = work done.

But the work done was the digging of the cellar and its volume is (length)(width)(depth).

The work done divided by Days gives amount done each day; by Hours, the amount done each hour; by Cu. ft., the Men needed. Now this argument applies to each set of conditions. Writing out:—

$$\text{M in second case} = \frac{\text{l in second case} \times \text{w in second case} \times \text{d in second case}}{\text{C in second case} \times \text{H in second case} \times \text{D in second case}}$$

Again—

$$\text{M in first case} = \frac{\text{l in first case} \times \text{w in first case} \times \text{d in first case}}{\text{C in first case} \times \text{H in first case} \times \text{D in first case}}$$

Instead of writing the words "in the second case," we may use a little 2 at the bottom of the letter. Equals divided by equals give equals and division by a fraction is performed by invert'ng it and multiplying.

$$\frac{M_2}{M_1} = \frac{l_2 \times w_2 \times d_2}{C_2 \times H_2 \times D_2} \times \frac{C_1 \times H_1 \times D_1}{l_1 \times w_1 \times d_1}$$

Substituting the values of the various quantities, we have

$$\frac{M^2}{5} = \frac{60 \times 27 \times 10}{C_2 \times 10 \times 10} \times \frac{C_1 \times 8 \times 8}{48 \times 20 \times 9}$$

If the men did not work uniformly and at the same rate in the two cases, there would be no problem. So $C_1 = C_2$. Cancelling we get $\frac{M_2}{5} = \frac{6}{5}$

If two equal fractions have the same denominator, the numerators are equal. Therefore the number of men needed in the second case is 6.

Of course the solution of the previous problem had to be developed at great length and the problems that follow show how the method really works.

If 5 pumps, each having a length of stroke of 3 ft., working 15 hr. a day for 5 d. empty the water from a mine, what must be the stroke of each of 15 pumps which would empty the same mine in 12 d., working 10 hr. a day, the strokes of the former set of pumps being four times as fast as those of the latter? *

(area of cross section) (length stroke) (no per hr) (hours) (days) (pumps) = (Quantity pumped.)

$$l = \frac{Q}{a\ n\ h\ d\ p'}\ .\frac{l_2}{3} = \frac{\dfrac{Q_2}{a \times n\tfrac{1}{4} \times 10 \times 12 \times 15}}{\dfrac{Q}{a \times n_1 \times 15 \times 5 \times 5}} = \frac{5}{6}$$

* Thomson's Commercial Arithmetic, page 187 number 17.

$l_2 = 2\frac{1}{2}$ ft.

If the 10 ct. loaf weigh 2 lb. 3 oz. when flour is \$9.75 per bbl., what should the 8 ct. loaf weigh, when flour is \$6.50 per bbl? *

$$\frac{\text{Price of bbl.}}{\text{Weight of bbl.}} \text{ factor of gain} = \frac{\text{price of loaf}}{\text{weight of loaf}}, \quad w = \frac{p\,W}{P\,f},$$

$$\frac{w_2}{2\frac{3}{16}} = \frac{\dfrac{8 \times W_2}{6.5 \times f}}{\dfrac{10 \times W_1}{9.75\,f}} = \frac{6}{5}, \quad w_2 = \frac{35}{16} \times \frac{6}{5} = 2\frac{5}{8} = 2 \text{ lb. } 10 \text{ oz.}$$

The method proposed can be used without change in preliminary instruction and whenever proportion can be taught by the present method. Nevertheless it is the opinion of the writer that the statement of relationship should form the thread upon which when once the four fundamental operations with integers have been taught the different topics of arithmetic are to be strung. Let the training of the sense of mathematical relationship be consciously done and not hidden behind the getting of answers. In a course arranged on such a basis, proportion would come naturally as a form of the more complex manipulation of statements and indeed the idea of the equation need not be avoided.

The same treatment will do for the kind of problems that appear in the text books on algebra.

The volumes of spheres are as the cubes of their radii. Find the radius of a sphere whose volume is equal to the sum of the volumes of three spheres whose radii are 3, 4, and 5, respectively. * *

$$V = k\,r^3, \; V_1 = k\,(3)^3, \; V_2 = k\,(4)^3, \; V_3 = k\,(5)^3,$$

$$V_4 = k\,(r_4)^3 = V_1 + V_2 + V_3 = k(3)^3 + k\,(4)^3 + k\,(5)^3$$

$$= k\,(27 + 64 + 125) = 216\,k,$$

$$(r_4)^3 = 216, \; r_4 = 6.$$

If the illumination from a source of light varies inversely as the square of the distance, how much farther from a candle must a book, which is now 15 inches off, be removed, so as to receive just one-third as much light * * *

$$L = \frac{I}{d^2}, \quad \frac{\frac{1}{3}}{1} = \frac{\dfrac{I_2}{d_2^{\,2}}}{\dfrac{I_1}{(15)^2}}, \quad \frac{1}{3} = \frac{(15)^2}{d_2^{\,2}}, \quad d_2 = 15\sqrt{3},$$

$$\text{Change} = d_2 - d_1 = 15\sqrt{3} - 15 = 15\,(\sqrt{3} - 1).$$

Proportion is studied not for itself but for its use in solving problems. The problems in arithmetic and algebra that have been given are representa-

* Ray's Test Problems (in Arithmetic) page 140 number 16.

* * Downey's Higher Algebra, page 187 number 33.

* * * Wells's Essentials of Algebra, page 290 number 19.

tive practice problems. The problem on the volumes of spheres shows that this treatment is useful in geometry. However the proposed method is at its best in the handling of real problems— in problems in which the result is the thing desired. The following problems in physics show this and will prove most suggestive and convincing to those who are familiar with the ordinary treatment of the parts of the subject in which these problems belong.

If a bar 60 cm. long, 2 cm. wide, 9 cm. deep is bent 1 mm by a weight of 30 kg., how much will a bar of the same material 80 cm. long, 6 cm. wide, 3 cm. deep be bent by a weight of 20 kg? *

The deflection varies directly as the weight; inversely as the breadth of the beam; directly as the cube of its length; inversely as the cube of its depth. Let k be the deflection produced by unit weight on a bar of the given material of unit length, unit breadth, and unit thickness.

$$d = \frac{k\ w\ l^3}{b\ h^3},\quad \frac{d_2}{1} = \frac{\dfrac{k\ (20)\ 80^3}{6\ (3)^3}}{\dfrac{k\ (30)\ 60^3}{2\ (9)^3}} = \frac{128}{9},\quad d_2 = 14.22\ \text{mm}.$$

A chemist generates 60 liters of gas at 10 degrees C. and a pressure of 70 cm. Find the volume of the gas at 0 degrees C. and 76 cm. * *

$$\frac{P_1\,V_1}{273+t_1} = \frac{P_2\,V_2}{273+t_2},\quad \frac{60\ (70)}{273+10} = \frac{V_2\ (76)}{273+O},$$

$$V_2 = \frac{60\ (70)\ 273}{283\ (76)} = 53.31\ \text{liters.}$$

A certain wire 1 meter long, weighing 8 grams, and stretched by a weight of 10 kg. makes 64 vibrations per second. What is the frequency of a wire of the same material 50 cm. long, weighing 16 grams, and stretched by a weight of 20 kg? * * *

The vibration frequency varies inversely as the length of the string; inversely as the diameter of the string; directly as the square root of the tension; inversely as the square root of the density of the material of which the string or wire is made.

$$n = \frac{1}{l\,D}\sqrt{\frac{T\,g}{\pi d}} = \frac{1}{2\,l}\sqrt{\frac{T\,g}{\pi r^2 d}},$$

* Wentworth and Hill's Textbook of Physics, page 24 number 10.

* * Ibid, page 105 number 22.

* * * Ibid, page 374 number 13.

$$\frac{n_2}{64} = \frac{\dfrac{1}{2(50)}\sqrt{\dfrac{20000\,g}{d_2\,\frac{16}{50}}}}{\dfrac{1}{2(100)}\sqrt{\dfrac{10000\,g}{d_1\,\frac{8}{100}}}},$$

$$n_2 = 64\,\frac{100}{50}\sqrt{\frac{20000\,g}{d_2\,\frac{16}{50}} \cdot \frac{d_1\,\frac{8}{100}}{10000\,g}} = 64\sqrt{2} = 90.5.$$

The writer has used this treatment of physics problems for several years with good success.

Now—what are the advantages of the proposed method? It seems to be able to solve every problem that the present method can. Pupils may be taught to translate with ease the double dot expressions into fractional form and so those trained under this method will have no more difficulty in reading mathematical books than is experienced by those trained under the present method. Its theory is less mechanical and more dependent upon common sense. It demands more explicitly a real understanding of the problem — an understanding that the present method really needs for certainty of result. This demand makes the younger pupil work slower; nevertheless it is believed that the confidence developed more than offsets this, for the writing out of the relationship forces the pupil to ask himself the questions that the skillful teacher has used to help him in recitation. It teaches him how to think logically to the result. Its application is more mechanical for problems that are understood. In cases where the problem depends upon a formula, the writing of the formula in its ordinary form leaves little more to complete the solution. The pupil has to remember but one form of the formula and not its several cases. And if the problem is understood and the formula has been forgotten, he may develop an abbreviated formula sufficient for the occasion. In a word his power to do the work is definitely trained.

MENTAL INDEPENDENCE *

By Francis Ramalay.

Nowadays, when higher education is so easily within the grasp of all, there is a possibility that students may not feel the importance of their college course as did the students of a generation or two ago. In those days it was only the exceptional young man who could pursue a college course, and such a young man went to college with a determination to gain knowledge and power from his study.

With the extreme development of the lecture system, which has been reached in many departments of our universities, there is great danger that the ordinary student will lose the best part of his college course. By this I mean that, under the lecture system, the student may come passively to absorb knowledge instead of actively pursuing it. To sit in a lecture-room and write down what a lecturer says is very easy as compared with studying things out by one's self.

True, a student is often required to report on assigned reading. But how many students there are who read merely what has been assigned and nothing more! They do not think of the habits of mental laziness which they are forming. Yet mental habits will be of far more importance in their future life work than will the facts which they have obtained from lectures or from the required reading which they have done.

The average student who works to get "credits" enough for graduation does not become mentally independent in the process. He relies almost wholly upon his instructors for his information. It does not occur to him that a time will come when he ought to be self reliant.

When such a student finishes his course, whether in a professional school or in college, he has stored up in his mind a great many facts. But before long a good part of this group of facts will be forgotten. Then what has he to show for his years of study? Only his diploma.

I believe that thinking people will agree that the mere acquisition of knowledge is not the aim of higher education. It should be only a part of such an education. Far more important than to have a horde of facts stored up in the mind is to have that mind trained in reasonable habits of thought.

* The substance of this article was given in an address to the students of the University Oct. 23, 1905 and was published in American Education Vol. IX, pp. 203-204.

Accuracy in judgment, ability to distinguish between truth and error, mental alertness—these are the things which should distinguish the educated man and woman.

How may the student gain these qualities? Not by mere study of lecture notes and assignments in books. This may help or it may not. The real way is for him to look things up on his own account. Perhaps a student has assigned to him some special topic for study. Will he gain much thereby if he only consults certain authorities cited by the professor? No, he will gain knowledge but he will add little to his mental ability.

He will find in his required reading many a reference to some side branch of the subject. He may say: "Well, maybe those things would be interesting to look up but they are not required." And that ends it. Let me tell you that this sort of thing long continued is mental suicide—nothing less.

The true student studies for the sake of finding out. He should find many a reference every day, which he will look up just for his own satisfaction. Such a habit formed now means much in after years. It is not enough to inquire from the professor about some obscure point. Let the student find it out for himself. Once away from the university, there will be no professors to ask.

It does not suffice to know how men have acted in the past when a certain difficulty has confronted them. Your trials and difficulties are going to be different from these. No two people live the same life. New situations are always arising. When a crisis comes you must act and act quickly. To do this you will need, not only a store-house of facts, but you will need mental agility—and this is not the property of him who sits languidly in his chair and memorizes what the professor tells him. Active thinking and self-directed study, not passive absorption of knowledge—these train us to cope with the difficulties of life.

He who would wish to be a power among his fellows must put his mind in training by his own individual study, sometimes of things related to his university work, sometimes of things far afield. There should be more use of reference books, more use of current magazines, especially the solid ones, more consultation of original sources and less dependence on text-books and lecture-notes.

The instructors are busy men. They have their time fully occupied in giving the best they can to their classes. They can not take the students separately and say to this one: "You need to do this," and to that one: "Your mind should be trained in that way." But each student can do much for himself. Let him get the habit of studying things out alone, whether in the library or in the laboratory; whether this be required by the instructors or not.

Anyone to be a leader in the community, to be esteemed of his fellow men, must be mentally independent. His mind must be trained through years of active exercise in real thinking—not mere remembering. To be mentally independent is to be self reliant, quick to see, quick to think, quick to distinguish truth from error, to be accurate in judgment—therefore, to lead a life governed by right reason.

RELATION OF THE COURSE OF STUDY TO HIGHER WAGES[1].

By John Burton Phillips.

Honorable William T. Harris, United States Commissioner of Education, has written: "In the earliest stage of civilization ninety-nine laborers out of each hundred are needed to supply raw material and rude manufactures for the community. With the growth of civilization a larger and larger number are detailed from the one hundred to provide creature comforts, protection and culture, and the teachers vocation in the United States at present by far leads in numbers the other vocations that have to do with providing culture for the community. These vocations are limited in their quotas only by the ability of the community to furnish a surplus of money beyond what is needed for the raw materials and the rude manufactures for food, clothing and shelter. In the future time a goal will be reached when one person in each hundred by means of machinery will furnish all the food, clothing and shelter needed for the other ninety-nine, and everyone of these ninety-nine will find ample employment in the higher occupations which provide means for creature comfort, protection and culture (2)"

What means shall we employ to reach this goal? In the struggle to attain it, ought we not to give some attention to the subjects taught in the schools? If machines are to take the place of men in producing things to satisfy material needs, it will be necessary to train men to make and use machinery.

Progress in civilization depends upon an increase in the production of those commodities that satisfy human wants. To satisfy more wants each individual must secure more commodities. To live better and have more comforts, our people must be able to buy more with their wages and salaries. Wages and salaries are paid from the product the workers are able to turn out, and they are therefore limited by the amount of wealth produced. Higher wages therefore require an increased production. Accordingly, the problem of progress is a problem of increasing production. Each worker must continually turn out a larger product. To expect the American laborer to

1. Reprinted from Education, Vol. XXVI, No. 8, (April, 1906) by permission of the editors.

2. William T. Harris in School and Home Education.

work harder or longer hours is out of the question, as the limit of human strength has already been reached; many of our laborers are now working beyond this limit, and injury to their health and to that of those depenedent upon them is the inevitable result. The only way to increase production is by a constant increase in the invention and use of labor-saving machinery. When machinery is used, production is limited only by the forces of nature instead of human strength as is the case with workers without machines.

Modern civilization is thus very largely the outgrowth of machinery. Increase in the invention and use of labor-saving machinery is therefore essential to progress. What effect should these facts have on those whose duty it is to arrange the course of study?

It at once occurs to every thoughtful person that the studies taught in the schools should be such as will lead the students to familiarize themselves with the social and industrial effects of machine industry and its relation to modern progress. Industrial history should be one of the leading studies in all schools. Children in the lower grades should be taught the stories of great inventions, and the industrial effects of these inventions should be thoroughly impressed on their minds.

Of the various movements contributing to produce modern civilization, none was more important than the industrial revolution. Yet, multitudes of our teachers have never heard of this. The contributions of inventors and labor-saving machinery to our civilization have always been largely overlooked by educators. Education has done little to encourage invention. Here is a table showing the amount of schooling enjoyed by the men whose inventions have contributed most to the welfare of the world:

Inventor	Invention	Date	Education
Franklin	Lightening rod	1752	No education *
Hargreaves	Spinning jenny	1764	Illiterate
Arkwright	Spinning frame	1769	No education
Watt	Steam engine	1769	Rudimentary common school
Crompton	Spinning mule	1779	No education
Cartwright	Power loom	1785	Oxford graduate
Fitch	Steam navigation	1787	Rudimentary common school
Whitney	Cotton gin	1793	Yale graduate
Evans	Steam navigation	1804	No education
Fulton	Steam navigation	1807	No education
Davy	Safety lamp	1815	Rudimentary common school
Stephenson	Locomotive	1821	No education
McCormick	Reaper	1834	No education
Morse	Telegraph	1843	Yale graduate
Goodyear	Vulcanized rubber	1843	No education
Howe	Sewing machine	1845	Rudimentary common school
Singer	Sewing machine	1850	No education
Bessemer	Steel manufacture	1856	Rudimentary common school
Ericsson	Monitor	18861	No education
Bell	Telephone	1876	Edinburgh graduate
Edison	Electric light	1880	No education

* The words, "No education" as used in this table mean absence of school or college opportunities.

From this table it appears that the great inventors have been men to whom public education has been very largely denied. The inspiration for their service to humanity did not come save in very few instances from the schoolroom. Why should so important a subject as the application of the forces of nature to what is now performed by human labor, be neglected in educational institutions?

There does not appear to be any good reason why a course in invention should not be offered in the higher institutions of learning. A course in which students would be made to realize the industrial needs that can be supplied by new inventions, might easily be given. One great reason why more inventions are not made is due to the fact that students are not trained to recognize economic waste. Why were improvements in harvesters so slow in coming? No attempt was made to invent harvesting machinery by anyone but the farmers. The invention of spinning machinery was left to spinners. The needle and thread were used for centuries but nobody tried to invent a sewing machine till 1844. Literature was taught in the schools, but no attention was given to pointing out great industrial needs. More labor-saving inventions would have been made years earlier had education pointed out to our young men the need of machinery in industry.

Since progress has been greatly limited by the absence of industrial instruction, is it not time that this error be corrected by so adjusting the curriculum that those trained in the schools will be prepared to see and remedy industrial defects by the invention of machinery? If the time desired by Commissioner Harris shall ever come when one man with machines will provide the material comforts for ninety-nine other men, and these ninety-nine be left free to devote themselves to art, literature and other cultural studies, that time will not be hastened by a course of study which provides for teaching art and literature in the schools to the neglect of industrial subjects. On the contrary, such a time will be hastened just in proportion as the importance of machinery in our civilization and the necessity of further labor-saving inventions, are brought home to our people by means of education. Higher wages being dependent upon increased production and increased production depending upon a greater use of machiery, it would seem to be the plain duty of educators to so modify the course of study that students may be able to understand thoroughly the industrial system and remedy its defects by new inventions. In this way the production of wealth would be increased and the resulting higher wages would give to our people a greater command over the comforts and pleasures of life.

THE COLORADO MATHEMATICAL SOCIETY

By A. C. Smith, M. A., North Denver High School.

Denver, Colo., Dec. 2, 1906.

On the evening of December 2, 1905, a meeting was held in the Metropole Hotel of Denver for the purpose of forming a mathematical society. Professor DeLong was appointed temporary chairman and Mr. A. C. Smith temporary secretary.

The meeting was called to order by the chairman and in the discussion that followed the consensus of opinion was that: The best field for work was along the line of improvement in the Teaching of Mathematics; that such an organization should be independent of the State Teachers' Associalton; that meetings should be held often enough to maintain interest and yet not so often as to inconvenience members coming from a distance; that such an organization be started in Denver and extended to other cities as soon as justifiable; and finally the discussions should be avowedly frank and aggressive. After the discussion the following motions were made, seconded and carried:

1. That a mathematical society be formed, its object to be for improvement of teaching mathematics;
2. Its name to be "The Colorado Mathematical Society;"
3. That Professor DeLong be President for the ensuing school year;
4. That Mr. A. C. Smith be Secretary for the ensuing school year;
5. That the program for next meeting should consist of each member responding at roll call on a subject of his own choosing (participation after each subject to be general);
6. Additional members are to be voted in and each member is entitled to bring a visitor.
7. The official organ to be School Science and Mathematics;
8. Expenses to be covered by subscription rate and assessments;
9. The next meeting to be Saturday, January 6, the succeeding meetings to be determined at that date and similarly for other meeetings.

The Secretary was directed to obtain quarters for the next meeting and adjournment followed.

Denver, Colo., January 6, 1906.

The second meeting of the Colorado Mathematical Society was held

in the Denver Normal and Preparatory School. The following is an outline of the proceedings:

E. L. Brown opened the discussion. Points touched on were:

1. That organizations of the present kind could not accomplish much in improving present conditions in teaching, they are suggestive rather than effective;

2. That the present procedure could be benefited by adopting in part the German methods (See Young's Teaching of Mathematics in Prussia's (Longman's Green & Co., 1900.)
e. g. less home work, and more oral class work. This would give more power in attacking problems, and minimize memorizing, mechanical methods etc;

3. Should or should not the high school give pupils a start on higher Algebra, Descriptive Geometry etc?

4. That pupils do not work as well as formerly because of increased social duties, athletics and the effort on the part of the teachers to make the work interesting or attractive, i. e. masking the dose as with sugar-coated pills;

5. That books contain too much.

Professor DeLong said that the competition between book companies was the chief cause for voluminous texts; that kindergarten methods of entertaining the pupil were forced too much; that the spirit of the times was nambypamby in matters pertaining to the rearing, governing, instructing and habits of study of high school pupils. Pointed examples from experience were given for illustration.

S. Epsteen showed that in the presentation of the most fundamental ideas in Geometry to beginners, it was impossible to be thoroughly scientific. Definitions of the straight line were considered and it was shown that the terms there employed were as much in need of being defined as were the terms they were to explain. The conclusion is that rigorous presentation as to logical sequence in any subject is a refinement which may be positively harmful to one beginning it. That self-evident propositions should be accepted without proof.

H. B. Leonard further discussed the tendency on the part of pupils to do less work and how this even developed into a sort of unionism against the teacher, the effect often being that a class will practically limit the character and amount of its own work. Some private schools avoid this by requiring a written contract from parents, giving the disposal of the pupils time to the school authorities. Further kindergarten and allied methods of instruction developes a professional jealousy in the teaching corps and turns out a blase and most undesirable type of student.

O. Price favors giving fourth year pupils a start in those subjects which they intend to take up in college. That in Plane Geometry the subject of

Limits be deferred until later in the course; where this should be was not discussed.

R. Reed suggested that the educational value of Algebra was possibly very much less than tradition would lead us to suppose, and that the results obtained do not justify the time spent upon it.

A. C. Smith mentioned that he had found it beneficial in his own classes to assign for a test a prescribed number of examples, these to be of a varied nature and sufficient in number to make the pupil work under high pressure if he was to cover the ground in a single recitation. This character of work was helpful to the pupil in that it requires him to improve himself in such things as speed, accuracy, a better understanding of principles, and gives him a better realization of his own limitations and ability.

The next meeting was set for Saturday, February 10, and adjournment followed.

Denver, Colorado, February 10, 1906.

The third meeting of the Colorado Mathematical Society was held in the rooms of the Colorado Scientific Society, Fourteenth and Lawrence streets.

Professor Chas. Burger and Mr. J. J. Browne of the Colorado School of Mines and Miss Grace E. Shoe of the North Denver High School were elected to membership.

Mr. H. B. Leonard opened the discussion for the evening. He made the point that in problem work it was desirable to have the pupil give a verbal statement outlining the method of solution before applying the necessary operations. Illustrations were given from problems in Proportion. It was suggested that further investigation in the different ways of presenting Proportion might be profitable.

Dr. Epsteen put the question—Which subjects in Mathematics are suitable for popular exposition and public lectures? Points suggested were: Probability, chance, life-insurance, matters of historic interest such as the discovery of Neptune, interpretation of formulae, the history of particular problems, biographies of noted men and accounts of their participation in Mathematics etc.

Professor DeLong stated that after twenty-five years experience in teaching Mathematics he felt as if test questions should include only what had been taught. That with such an understanding the student prepared his work more thoroughly and with more profit to himself. Opinions on this point differed somewhat.

The privilege of using these quarters in the future was secured to the Mathematical Society through the kindness of Geo. L. Cannon. We are here as guests of the Colorado Scientific Society.

Orville Price was appointed to prepare a program for the next meeting.

A. C. SMITH, Secretary.

Denver, Colo., March 17, 1906.

The fourth meeting of the Colorado Mathematical Society was held in the Conservatory of Music on Saturday, March 17 at 8 P. M.

Miss Ruby L. Carstens, W. H. Parker and W. W. Putman were elected to membership.

Miss Grace Shoe discussed various means of enriching our mathematical work in the high-schools. It was shown that in any subject, class interest could be naturally stimulated if a short history of its origin and development were given. also that puzzles, interesting stories of particular problems and biographical sketches of noted mathematicians could be profitably used. By doing such work it was thought possible to create a desire among the pupils for this information, and to the extent even that a mathematical club would be a possible outcome. Letters from a number of educators bearing on this last point were then read. Most of them approved of the idea but no one had tried it. Points suggested for discussion were:

1. Has the kind of work above outlined a value?
2. Can such work be given without too great loss of time?
3. Should such work be done through a club?

H. B. Leonard thought a club would justify its usefulness if pupils simply prepared papers, that meeting together was not absolutely necessary.

In a club meeting it would be a source of inspiration to the pupil to see a teacher deal with material outside the ordinary run of the text. Here also he could be shown mathematical fallacies which he should know. For this work suitable literature would be a necessity. Ten schools could subscribe for all this. This difficulty might be overcome by having an exchange bureau. It was further suggested that in club work translating something from the French or German would be useful.

Prof. DeLong felt that the fixed course of study demanded the pupil's best efforts and that it was all that he could handle. The average pupil is usually asturated with mathematics before reaching college and cared only to satisfy requirements. In our present curriculum the child's activities are too scattered, he gains breadth but not depth.

Mr. Price considered that the present course of study was so heavy as to be prohibitive of club work and that it was just as reasonable to have clubs for French, German, &c. as it was for mathematics.

R. Reed said that the number of pupils capable of doing such work were too few to make it a success.

The principal topic of the evening was a paper by Dr. Epsteen, entitled. "The Influence of Modern Geometrical Research on Secondary Teaching." After explaining briefly the role of the modern researches in the History of Geometry; its effects on the teaching of the subject were taken up. One of the most important of these effects is the experimental method. Dr. Epsteen

then read a communication from Professor G. W. Greenwood wherein the writer has elaborated a complete course in Geometry which incorporates the best results of the recent researches.

An Exchange Bureau was created for the purpose of collecting historical, biographical and other general mathematical material.

It is intended that the Bureau shall supply all this sort of material, without charge, to members who are in schools which do not possess large libraries.

Miss Shoe was appointed custodian of all such papers as the above, as well as other literature to be sent in by members of the society.

A. C. SMITH, Secretary.